SmoothVideo Project

User Manual

Program version: 4.1

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Table of contents

SVP – SmoothVideo Project

SVP is a program for improving the smoothness of the video for a large number of popular video players on Windows, macOS, and Linux platforms. The main task of SVP is to increase the frame rate of video by adding intermediate frames. Alternatively, this process is called motion interpolation, or FRC ("frame rate conversion"). Interpolation increases the video dynamic clarity, and the movements of objects become smoother.

How it Works

Once the video playback starts in any of the compatible players, SVP integrates the player with a special software module that performs on-the-fly video processing.

SVP manages this module by passing it the selected parameters for intermediate frame calculation. SVP selects these parameters based on the source video format, the desired result, the personal preferences of the user, and the computer hardware.

SVP can perform additional video processing, such as:

- searching and cropping of black bars;
- image scaling;
- black bars lighting.

Video playback without SVP
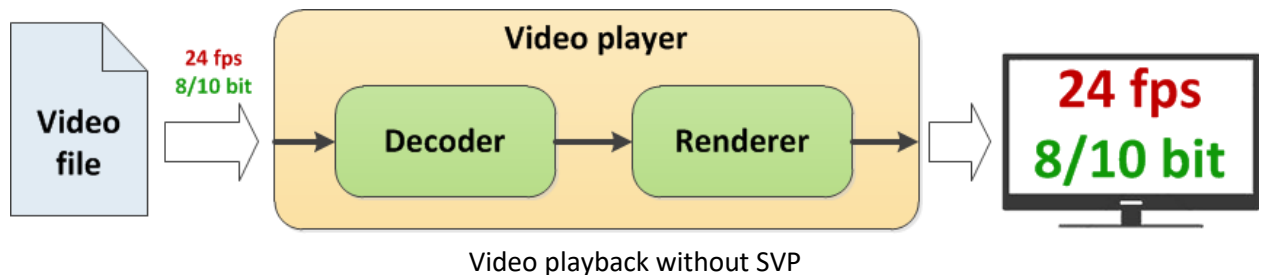
There are multiple ways for integrating the SVP module into players:

- For **DirectShow**-compatible players in Windows – the **ffdshow** video filter is added to the list of additional filters; it loads the SVP module using the **Avisynth** interface.
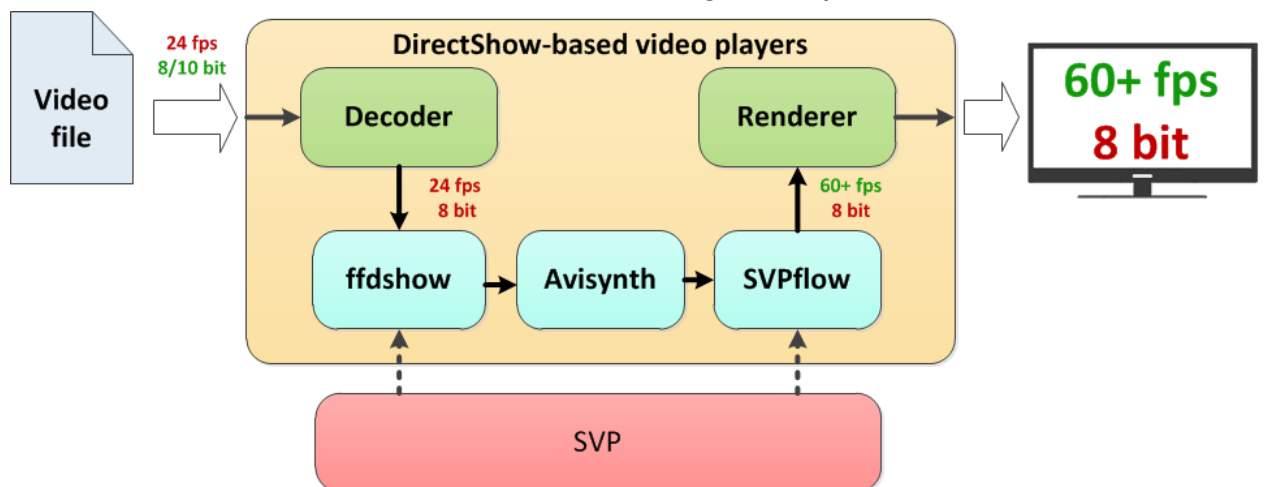
- For a **Daum PotPlayer** in Windows – no need to load the **ffdshow** filter, SVP can work with **Avisynth** directly.
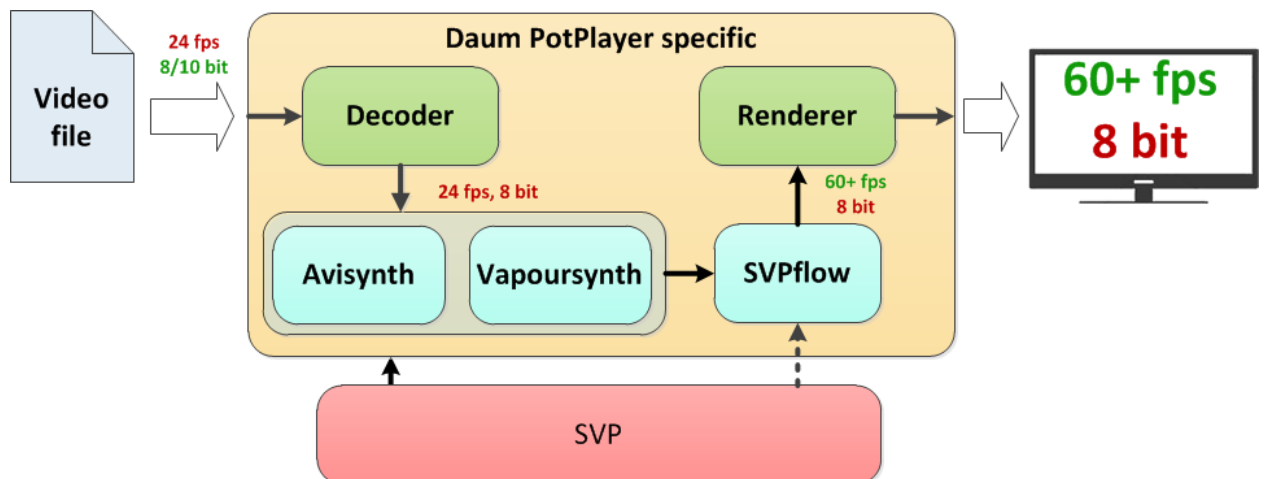
- For **mpv** and all **mpv**-based players – the SVP module is loaded using the **Vapoursynth** interface.
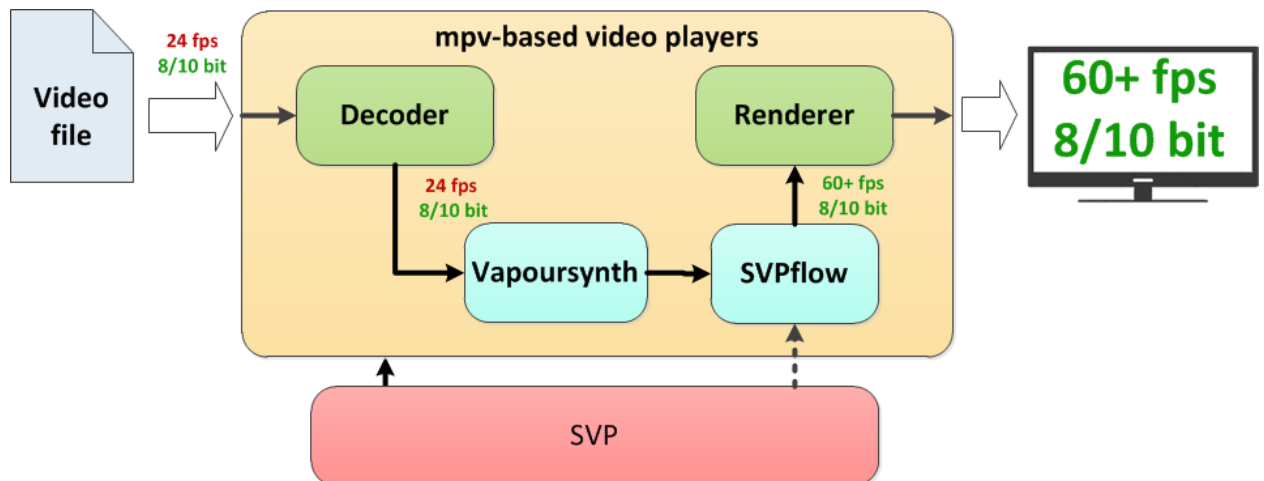
- For **VLC** player in Windows, macOS, and Linux – the built-in "**deinterlace**" filter is replaced with the SVP filter, which loads the SVP module using the **Vapoursynth** interface.
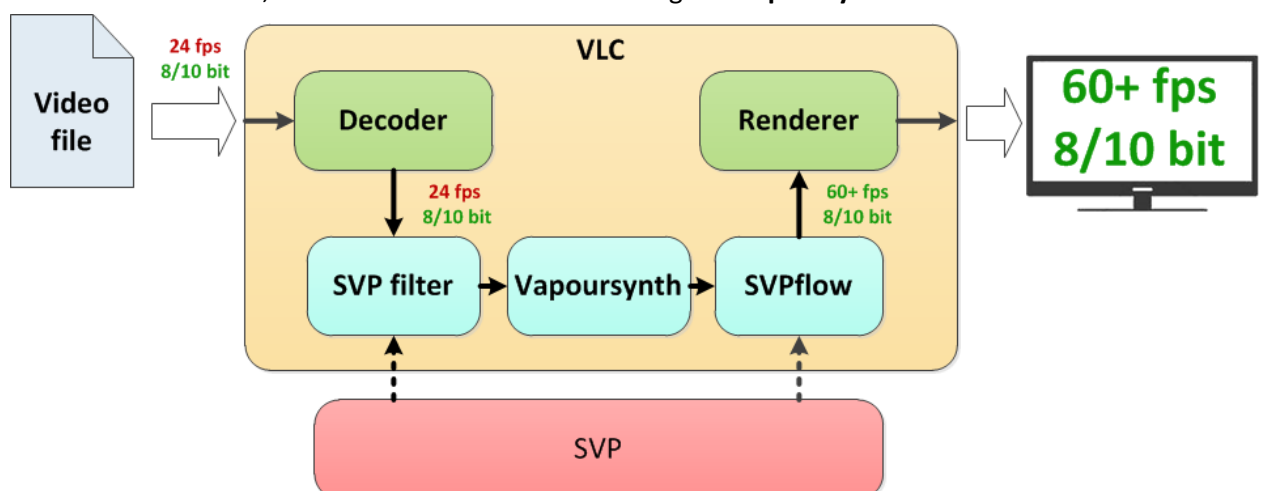
- For **Apple QuickTime, Cyberlink PowerDVD, Netflix**, and some other players, designed for playing back copy-protected videos, SVP cannot be used.

For successful integration, both the player and SVP must be running under the same user account. For example, in Windows, SVP does not work if the player is running with administrative privileges and SVP is running without them, or vice versa.

SVP does not work in a web browser when you play back videos on websites such as YouTube or Crunchyroll. To increase the frame rate in such a video, you need to open a video stream in one of the compatible players. For this, the SVPtube module is designed, see the "Online video playback" section.

Hardware Requirements

SVP uses both central and graphics processor units (CPU and GPU). Due to realization specifics, most of the load is the CPU load, thus the larger video frame size is the more powerful CPU is required.

Video format	Minimum CPU requirements	Recommended CPU requirements
Less than FullHD (**DVD**, **HD 720p**)	• Any processor except for the Intel Atom series	• Intel Pentium (2 cores)
Full HD (1080p)	• Intel Pentium (2 cores)	• Intel Core i5 (4 cores) • AMD Ryzen 3 • AMD FX (6 cores)
Ultra HD (4K, 2160p)	• Intel Core i7 (4 cores)	• Intel Core i7 (6 cores) • AMD Ryzen 7 (8 cores)

SVP can work without the use of GPU, but this reduces the quality of intermediate frames calculation and significantly increases the requirements for CPU performance; so, using a GPU is highly recommended. Its power is not especially important (for example, a GPU integrated into Intel Core 6th gen. processors, is sufficient for calculating intermediate frames up to 4K@60 fps.

To use high-quality video renderers, such as **madVR** or "**opengl-hq**" mode in **mpv**, you need a dedicated mid-range GPU.

Software Requirements

SVP requires one of the following operating systems:

- **Microsoft Windows XP** or later, preferably 64-bit edition. For **mpv** and **VLC** players, as well as for **SVPtube**, at least **Windows 7** is required.
- **Apple macOS 10.9 "Mavericks"** or later. Automated installation of necessary system packages is available only in **macOS 10.11 "El Capitan"** and later.
- **Linux 64-bit,** released not earlier than 2015; **Ubuntu 16.04** or later is recommended.

To install the full version of SVP with support for all players, 200 MB of free disk space is required.

SVP supports most of the popular players. The table below contains a list of players that has been verified by the SVP team. Because this list is not comprehensive other players may work with SVP too.

Windows	macOS	Linux
• BS.Player • Daum PotPlayer • Emby Theater • GOM Player • JRiver Media Center • KMPlayer	• IINA • mpv • Plex Media Player • VLC	• mpc-qt • mpv • Plex Media Player • SMPlayer • VLC

• Kodi / XBMC • MediaPortal • MPC-BE • MPC-HC • mpc-qt • MPDN - Media Player .NET • mpv (64-bit) • Plex Media Player • ProgDVB • SMPlayer • Stereoscopic Player • VLC (64-bit) • Whirligig VR • Windows Media Player • Zoom Player		

To enable SVP support in a player, you need to perform a few simple configuration steps. In addition, the player must be configured to perform hardware video decoding; otherwise, software video decoding, especially **Ultra HD**, could affect the CPU performance and interfere with the operation of SVP. See separate instructions for each player listed above.

Installation and Upgrade

The following versions of SVP are available:

- **SVP 4 Free** – a free version of the program for Windows; does not support **mpv** and **VLC** players; the features for interpolation fine-tuning are not available. It is also not possible to use the SVPtube and SVPlight extensions.
- **SVP 4 Pro** – a full version of the program for Windows. This version of program is available only after purchasing on the SVP website.
- **SVP 4 Mac** – a full version of the program for macOS. This version is available only after purchasing on the SVP website.
- **SVP 4 Linux** – a full version of the program for Linux distributed at no cost.

See the feature comparison for all these versions.

SVP 4 Free и SVP 4 Pro Installation

To install SVP 4 Free and SVP 4 Pro versions, different setup files are used. If you already use SVP 4 Free, to install SVP 4 Pro you must first uninstall SVP 4 Free, and then install SVP 4 Pro.

During the process, an active connection to the Internet is necessary. The installer downloads the necessary packages from the SVP website. For the SVP 4 Pro users, there is an "offline" version of the setup program that contains all the packages.

To install SVP 4 Free or SVP 4 Pro:

1. Download the setup file from the SVP website or via the link from the email if you have purchased SVP 4 Pro. The link is also available in the License manager (see the "Viewing and managing the license" section).
2. Run the setup file. The installation wizard starts.
3. Follow the wizard instructions:
   a. Select the folder to install SVP.
   b. Select the players for which SVP integration will be available.
   c. You can install SVPlight and SVPtube, if needed.
   d. If needed, you can additionally install the following programs:
      - **MPC-HC** – a popular player, pre-configured to work with SVP;
      - **madVR** – a high-quality video renderer for **DirectShow**-compatible players;
      - **ReClock** – a **DirectShow** filter to ensure accurate synchronization of video output with screen refresh rate;
   e. If necessary, you can perform manual selection by pressing on **Switch to components selection** button.
   f. Read and accept the terms of the License Agreement.
   g. Select the Start menu in which you would like to create the program's shortcuts.

In case you need a proxy server to connect Internet you may need to specify it on the first screen of the wizard. To do this, press **Settings** button and either select **System proxy settings** or specify a proxy server address. Otherwise the installation may be aborted with the following error message:
Could not download archive %NAME%: Connection closed

SVP 4 Mac Installation

SVP 4 Mac requires preinstallation of some system libraries (**Python 3**, **Vapoursynth**, and a special build of **mpv**). For this, we recommend that you use the **Homebrew** package manager.

To install SVP 4 Mac:

1. Download the **DMG** image via a link from the email you received after purchasing SVP 4 Mac. The link is also available in the License Manager (see the "Viewing and managing the license" section).
2. Mount the SVP 4 Mac image.
3. Drag the SVP 4 Mac icon to the **Applications** folder.
4. Install the **mpv** player and the system libraries required to run SVP:
   a. For macOS 10.11 "El Capitan" and later: launch the "**install mpv.command**" batch file to perform an automated installation of the required components with the help of **Homebrew**. To bypass the security system, click the file with the **Control** key pressed, and then, in the terminal window that opens, enter the password you use to log into the system.
   b. For macOS 10.9 and 10.10: see the guide for installation in manual mode.

SVP 4 Linux Installation

It is recommended to install SVP 4 Linux on a computer running operating system Ubuntu 16.04 or later, 64-bit edition. Please report any issues with SVP running in other Linux operating systems to SVP Technical Support Service (see the "Providing a feedback" section).

SVP 4 Linux is available only as a binary distribution.

Before installing SVP 4 Linux, install the following packages:

- **Qt 5.5** or later;
- **Vapoursynth;**
- **Mediainfo;**
- **Python 3.5;**
- Proprietary video drivers with OpenCL ICD (AMD, NVIDIA), or Beignet for Intel;
- **mpv** compiled with support of **Vapoursynth** script engine;
- **lsof.**

To install SVP 4 Linux:

1. Download the SVP 4 Linux archive from the SVP website. Unzip the archive.
2. Run the installation file with the RUN extension. The installation wizard will start.
3. Follow the wizard instructions:
   a. Select the directory to install SVP.
   b. If needed, select SVPlight and SVPtube.
   c. Read and accept the terms of the License Agreement.

Additional Components

For custom installation of the SVP 4 Free, SVP 4 Pro and SVP 4 Linux components, **Maintain SVP 4** application is designed. Using it, you can add components that were not selected during the installation of the program.

To install additional SVP components:

1. Open the main menu via the SVP icon.
2. Select **Utilities → Additional programs and features**.
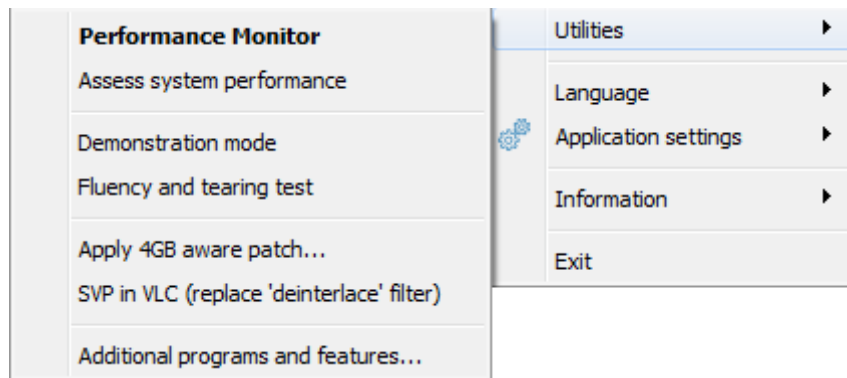
3. In the appeared window, select **Add or remove components** and click **Next**.

4. Select the components you want to install and click **Next**.

In SVP 4 Mac, all components are already installed, but the SVPtube and SVPlight modules are disabled by default. To enable the use of SVPtube or SVPlight, follow the steps below:

1. Open the Main menu via the SVP icon.

2. Select **Application settings** → **Additional options** → **Extensions**.

3. Mark the required module; after that SVP will be restarted.
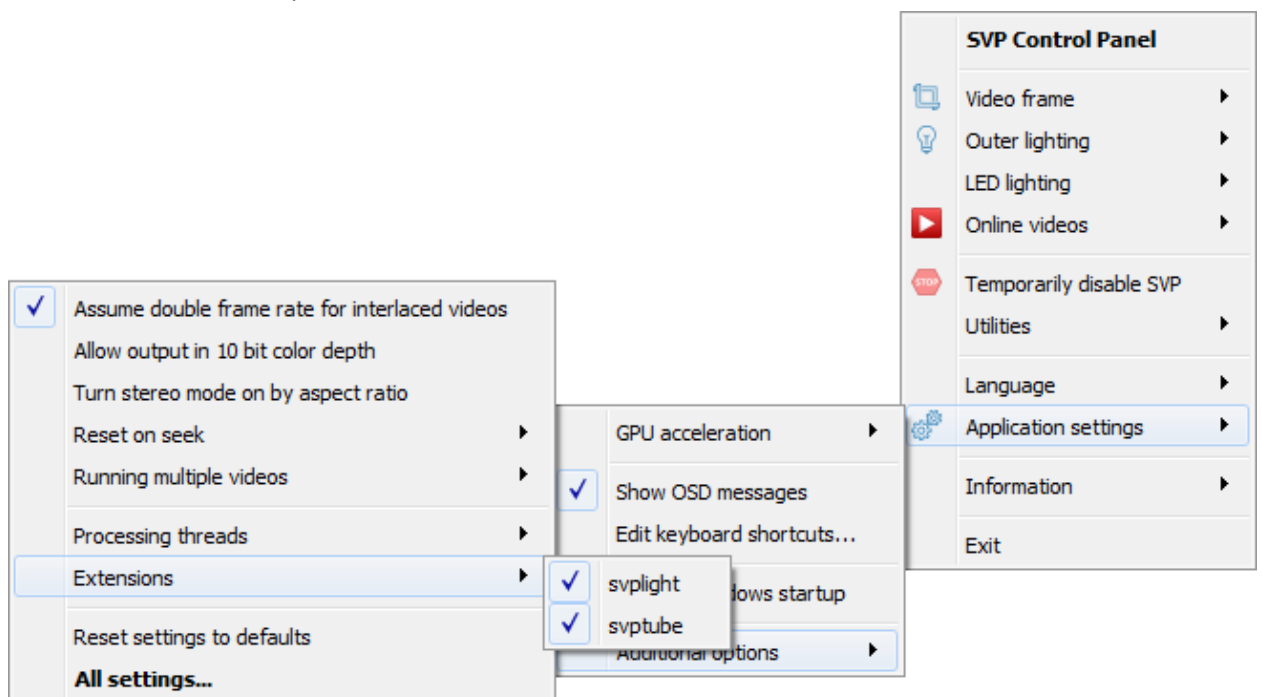
Updates

Updates for SVP, and its components (packages) appear regularly, bringing new functions or fixed issues. Once an update is available, you will see a message in the system notification area and the Updates section containing the list of changes will appear in the SVP Control Panel.

Updating of SVP 4 Free, SVP 4 Pro, and SVP 4 Linux is performed via **Maintain SVP 4** application. To update SVP, do the following:

1. Open the **Updates** section in the Control panel.
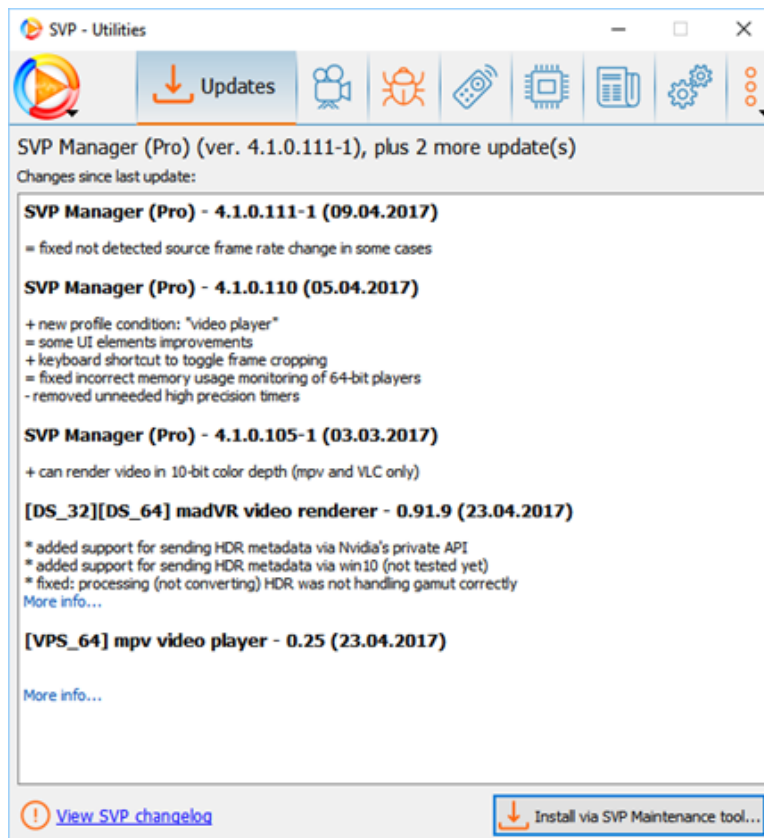
2. Check the list of available updates with their changelogs. Clicking the link **More info** opens a website of the component's developer with a more detailed changelog.

3. Click the **Install via SVP Maintenance tool** button. Select **Update components** in the window that appears. Click **Next**.

4. Select the components you want to update and click **Next**. SVP will install the selected updates.
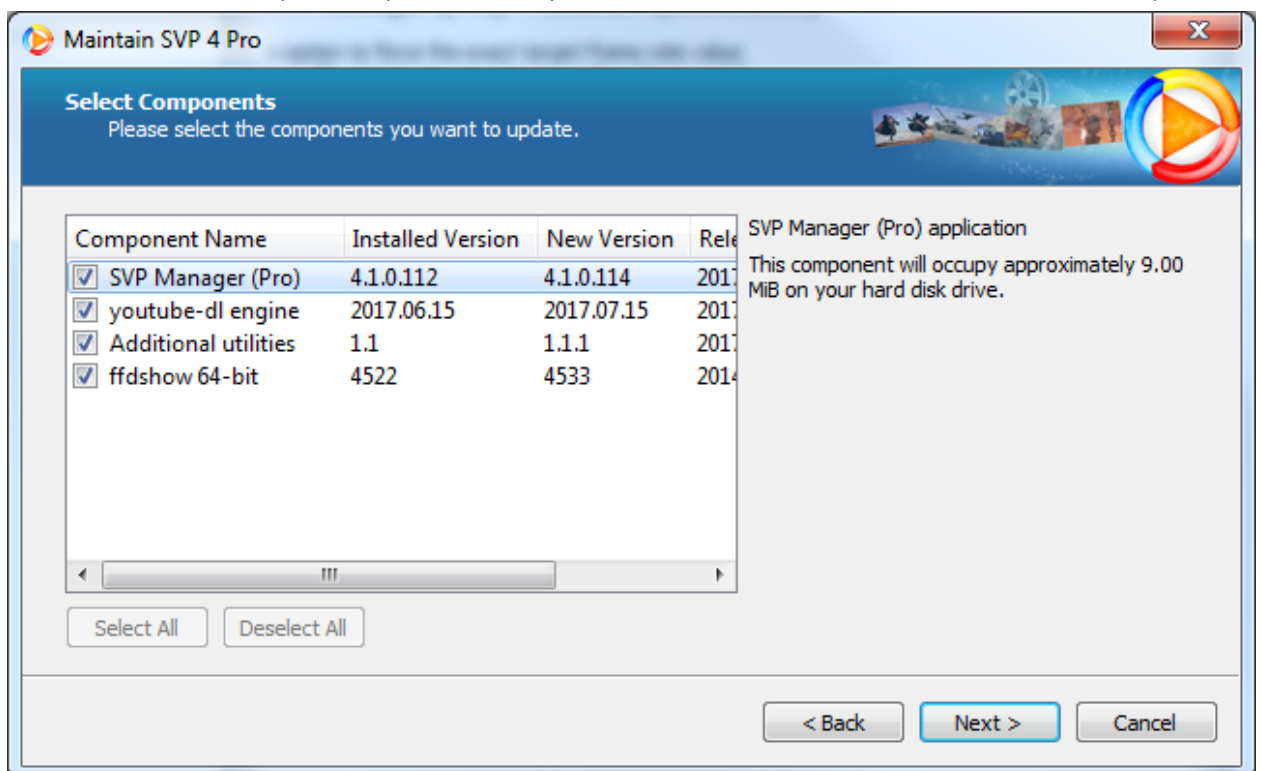
To update SVP 4 Mac, you need to download a new version of the **DMG** image via the License Manager.

License and Activation of SVP

To activate SVP 4 Pro or SVP 4 Mac, you should purchase a license key on the SVP website. After the license has been paid for, you will receive an email with a license key and a link which can be used to download the setup file. License key is a unique sequence of Latin letters and digits in the **XXXXX-XXXXX-XXXXX-XXXXX-XXXXX** format.

You can purchase a license key for using SVP on multiple computers simultaneously. If necessary, you can increase the number of computers on which simultaneous use of SVP is allowed.

To activate SVP, the first time you run SVP 4 Pro or SVP 4 Mac, enter the email address used to purchase the license and the license key.
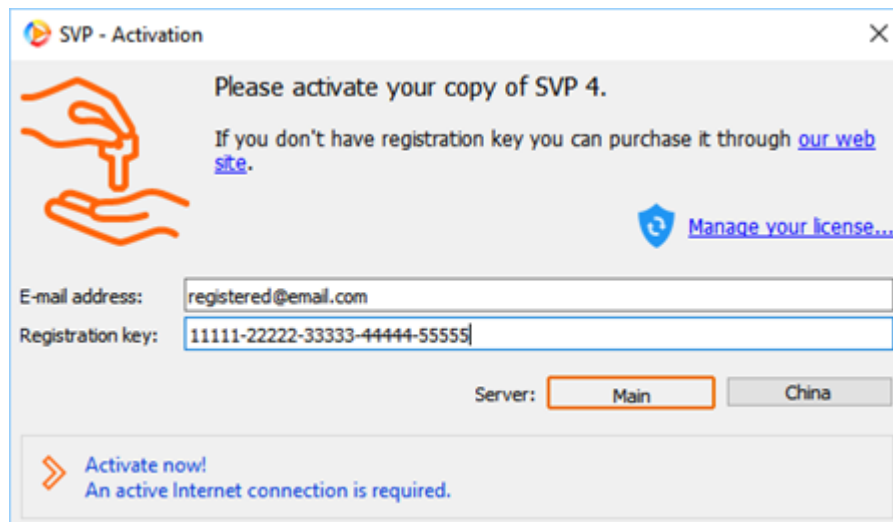
If an activation error occurs, make sure that:

- Your connection to the Internet is active, the Internet is available and the website "https://www.svp-team.com" opens in a web browser.

- The email address and the license key are copied exactly from the confirmation email; (when selecting a text segment, pay attention to any unnecessary signs or spaces at the beginning and at the end of the segment).

- Your limit for the number of computers allowed to use SVP simultaneously is not exceeded. Otherwise, click **Manage your license** to open the License Manager for removing the out-of-date activations.

Viewing and Managing the License

License manager is a web service for managing your SVP 4 Pro and SVP 4 Mac licenses. You can find the link to it in the email received after payment.

To access the License Manager, you must log in using your email address and license key.

You can perform the following actions:

- View information about the license: type (platform), date of purchase, method of payment. If the license was declared invalid, the reason for it is indicated (for example, an open dispute in the **PayPal** system).

- Download setup programs for specific versions of SVP 4 Pro and SVP 4 Mac, including the "offline" versions.

- View the maximum number of computers on which simultaneous use of SVP is allowed, separately for Windows and macOS.

- Extend the license to cover additional computers.

- View the list of computers on which SVP is currently activated.

- Delete activations in case you need to transfer the installation of SVP to another computer. Also, after a major update of the operating system, you may need to activate SVP again. For this, select an out-of-date activation in the list and click **REMOVE**.

Increasing the Frame Rate

The main task of SVP is calculating the intermediate frames and adding them to the video stream. This task involves multiple parameters and options. For changing the settings on the fly, video profiles can be used. General settings that you do not need to change frequently, are specified in the SVP Main Menu.
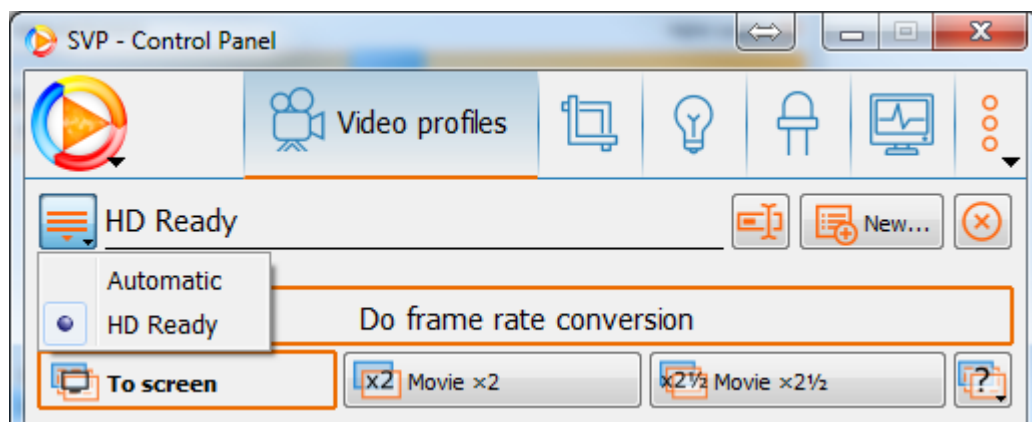
About the Profiles

Profile is a set of options for calculating new frames during motion interpolation. You can create multiple profiles and select the optimal settings for playing back different types of video. By default, SVP uses the **Automatic** profile with a set of options selected based on your computer performance. The **Automatic** profile cannot be renamed or deleted. Also, for the **Automatic** profile, you cannot manually change the settings and conditions of use.

A profile includes:

- profile name;
- target frame rate;
- options for calculating intermediate frames;
- conditions of profile use.

When a video plays back, the options from the profile that matches most by the conditions for its applying are used.

Any change to the profile is saved automatically; however, until another profile will be selected, the changes can be undone by clicking the **Revert** button.

You can view a list of all profiles and switch between them via the **List all video profiles** menu button.

During video playback, switching to another profile from the list in this window will not replace the profile currently used for the video. For more information, see the "Using a Profile" section.

Adding a Profile

To add a new profile:
1. Open the **Video profiles** section of the Control Panel.
2. Select any profile from the list and click the **New** button. A new profile will open, with all the options and conditions copied from the current one.
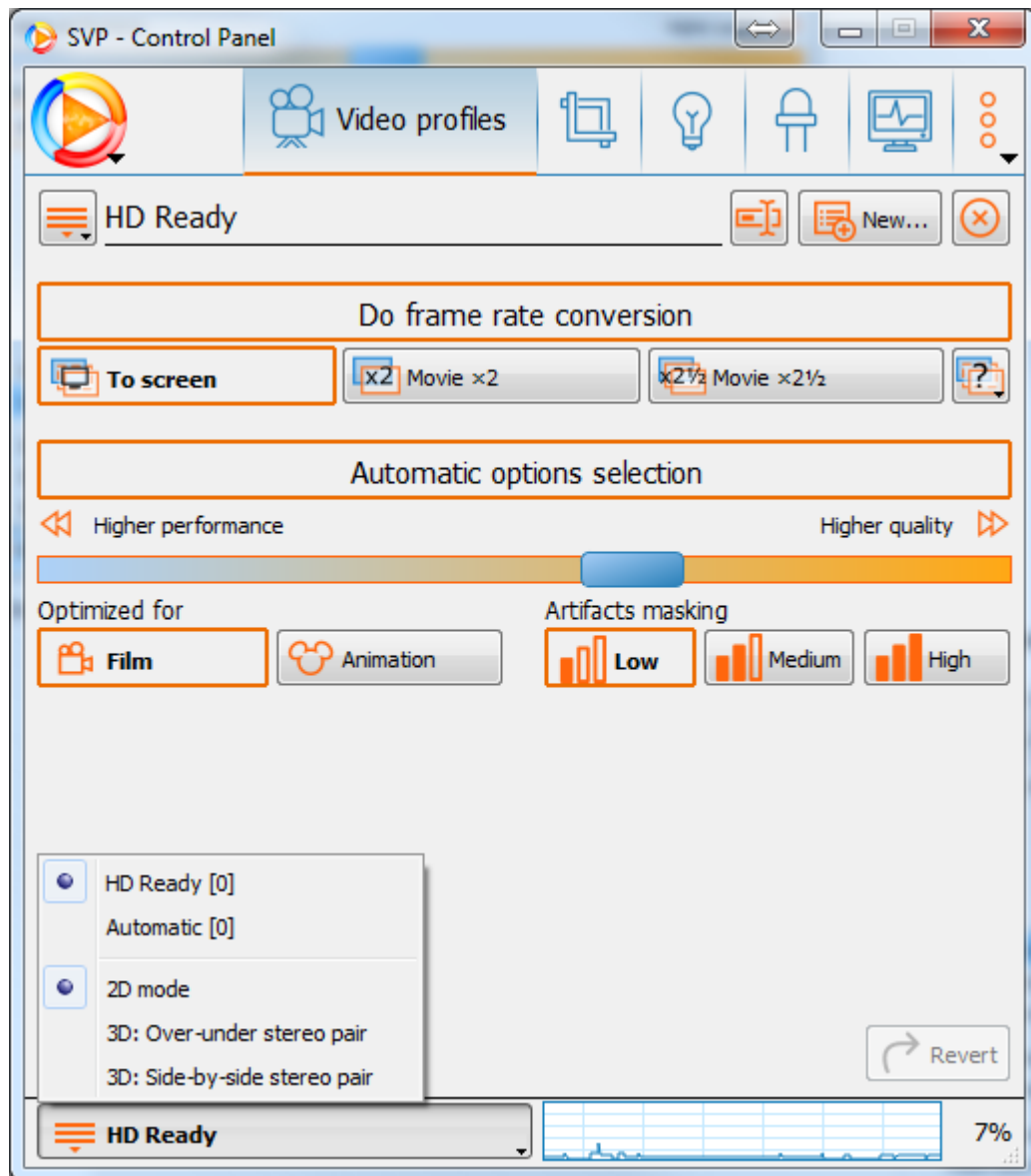
3. Specify the settings for the new profile:

   a. Enter a name for the profile. You can rename the profile later by clicking the **Modify profile title** button. You cannot rename the **Automatic** profile.
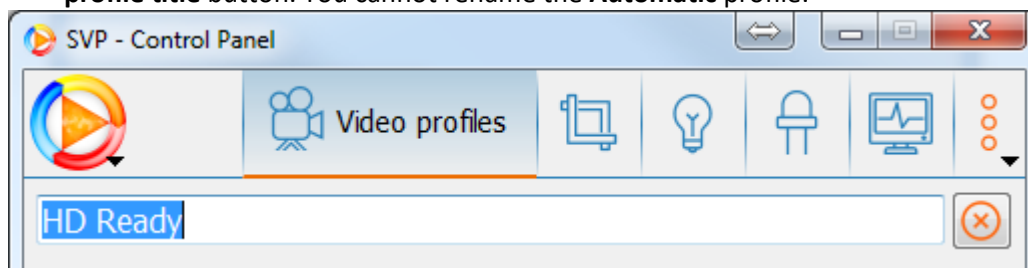
   b. If you want SVP to increase the frame rate of the video, click the **Do frame rate conversion** button.

   You can also disable this function. With this function disabled, SVP will continue to process the video, for instance, continue to crop or highlight black bars. To completely disable SVP during video playback, click the **Temporarily disable SVP** button.
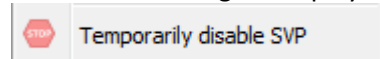
c. Select the resulting frame rate. By default, as well as in the **Automatic** profile, this rate is equal to the screen refresh rate.
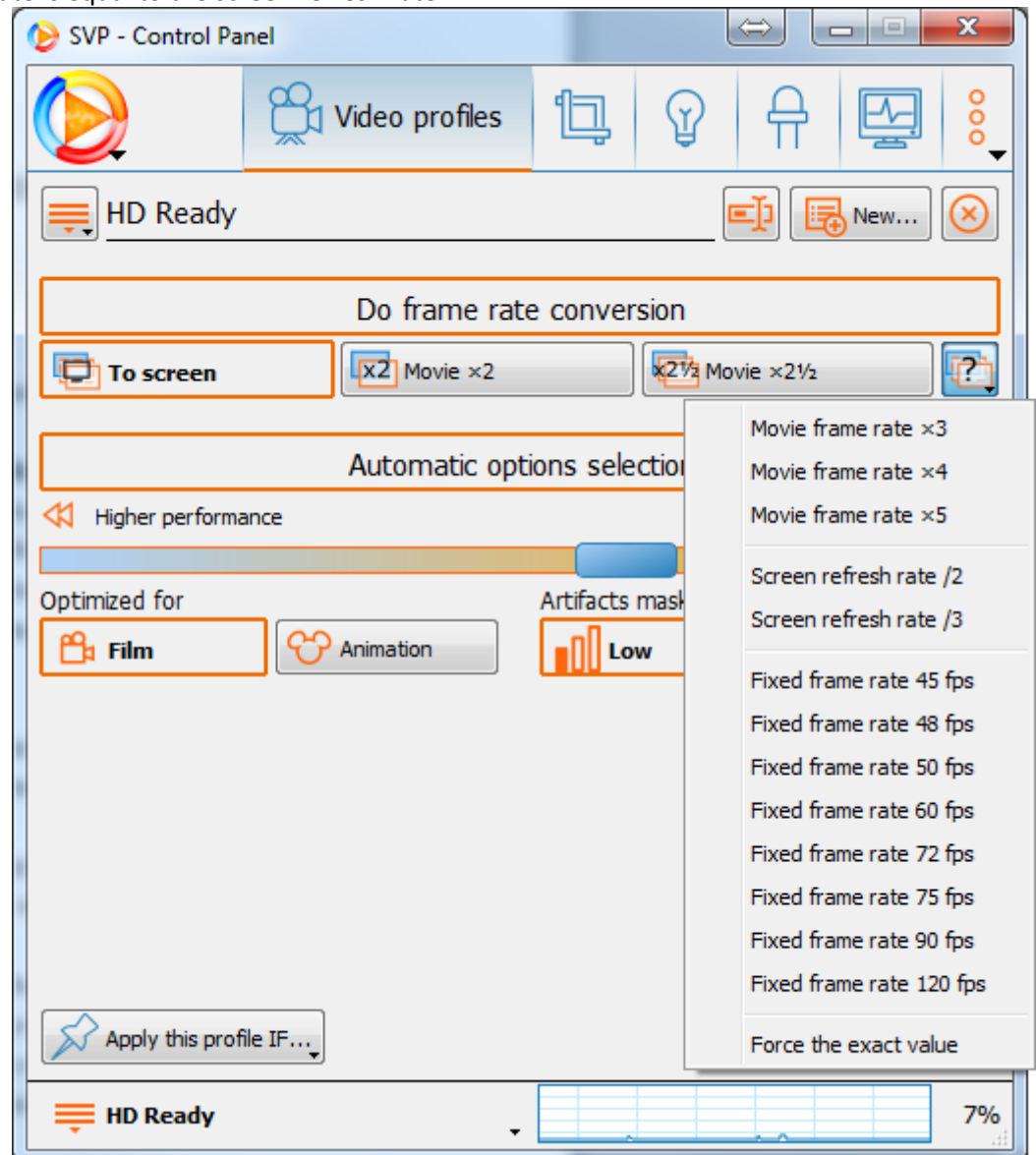
By using the corresponding buttons and the additional menu on the **Other target frame rates** button, you can select the following values:

- multiples of the initial frame rate of the video being played back: x2, x2.5, x3, x4, x5;
- fractions of the screen refresh rate: /1, /2, /3;
- fixed frame rates: 45 fps, 48 fps, 50 fps, 60 fps, 72 fps, 75 fps, 90 fps, 120 fps.

Other values can be specified using a numerical option "**fi_target**" in the **Application settings** section of the Control Panel.

During playback of a video with variable frame rate, it is recommended that you set the double frame rate (x2).

d. If needed, change the options for calculating intermediate frames. See the "Automatic options selection" and the "Manual options selection" sections.

e. Select the conditions for applying the profile in the **Apply this profile IF** list (see the "Conditions for applying the profile" section).

To delete the profile that is currently selected, click the **Delete profile** button. You cannot delete the **Automatic** profile.

Automatic Options Selection

If you press the **Automatic option selection** button, SVP will automatically select the options based on the computer performance and video characteristics to ensure the maximum quality of the video while maintaining the system workload at average level.
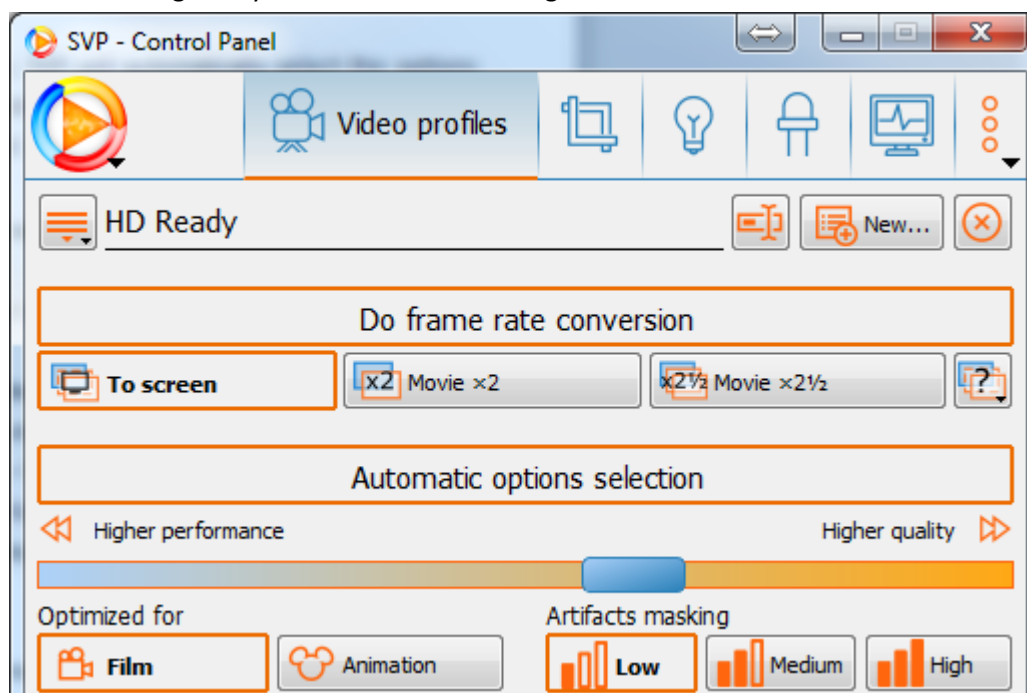
In some cases, the algorithm that selects options can make a mistake, which results in:

- too high CPU load, or
- too low CPU load, however with the lower values selected for the settings than the values that provide the maximum quality.

In these cases, using the **Higher performance / Higher quality** slider control, you can shift the limit of the allowed CPU load that the algorithm currently uses. The more left the slider is shifted, the lower values for the options will be selected. The more right – the higher values, but not higher than the values that provide maximum quality according to the developers of SVP. For example, for a powerful eight-core system, the same "maximum" values will always be selected for most video formats, regardless of the position of the slider.

You can use the following additional options:

- **Optimized for Film/Animation** – The **Animation** mode uses calculation options optimized for hand-drawn animations (cartoons), which are characterized by sharp contrasting borders of objects and a static background.
- **Artifacts masking** – Three levels of additional suppression of calculation errors (artifacts) appearing on intermediate frames. High levels of artifact suppression reduce the effect of smooth movements and image clarity.

The algorithm, which selects the options, is based on the results of the computer performance measurement, which has been performed when you first run SVP after installation. You can repeat this measurement manually by selecting the **Utilities → Assess system performance** command from the Main menu.
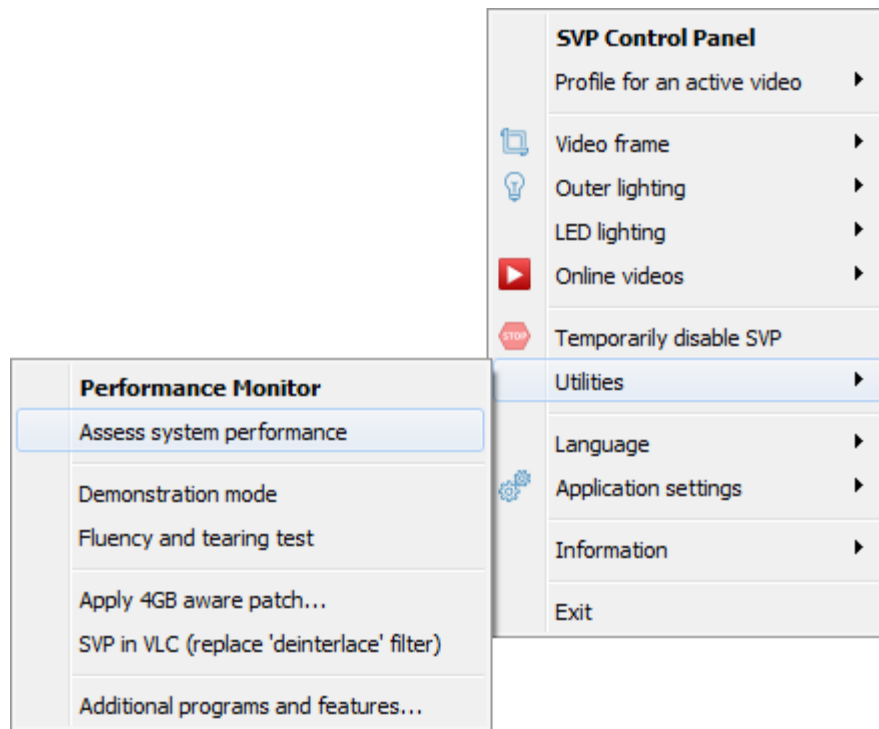
Before launching the measurement, close all resource-intensive applications, for example, web browsers.
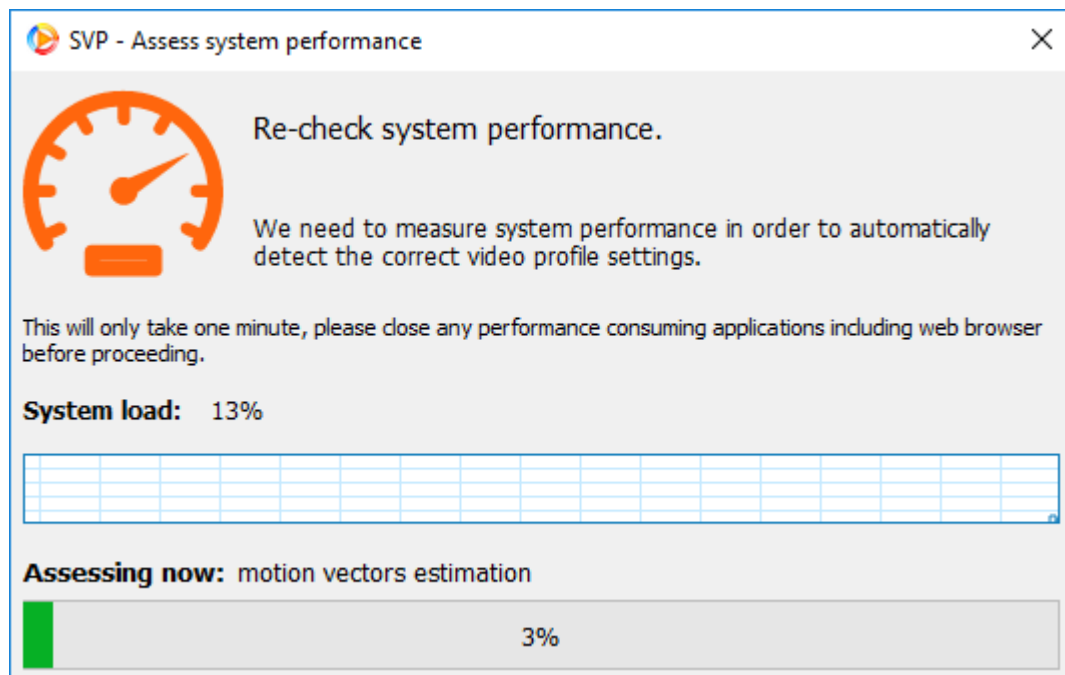
Manual Options Selection

To switch to manual mode, turn off the **Automatic options selection** mode**.**

Manual mode is not recommended for novice SVP users because the user needs to understand the consequences of changing each option as well as its meaning. Setting all options to the maximum possible values will worsen the quality of motion interpolation and significantly increase the load on the system.
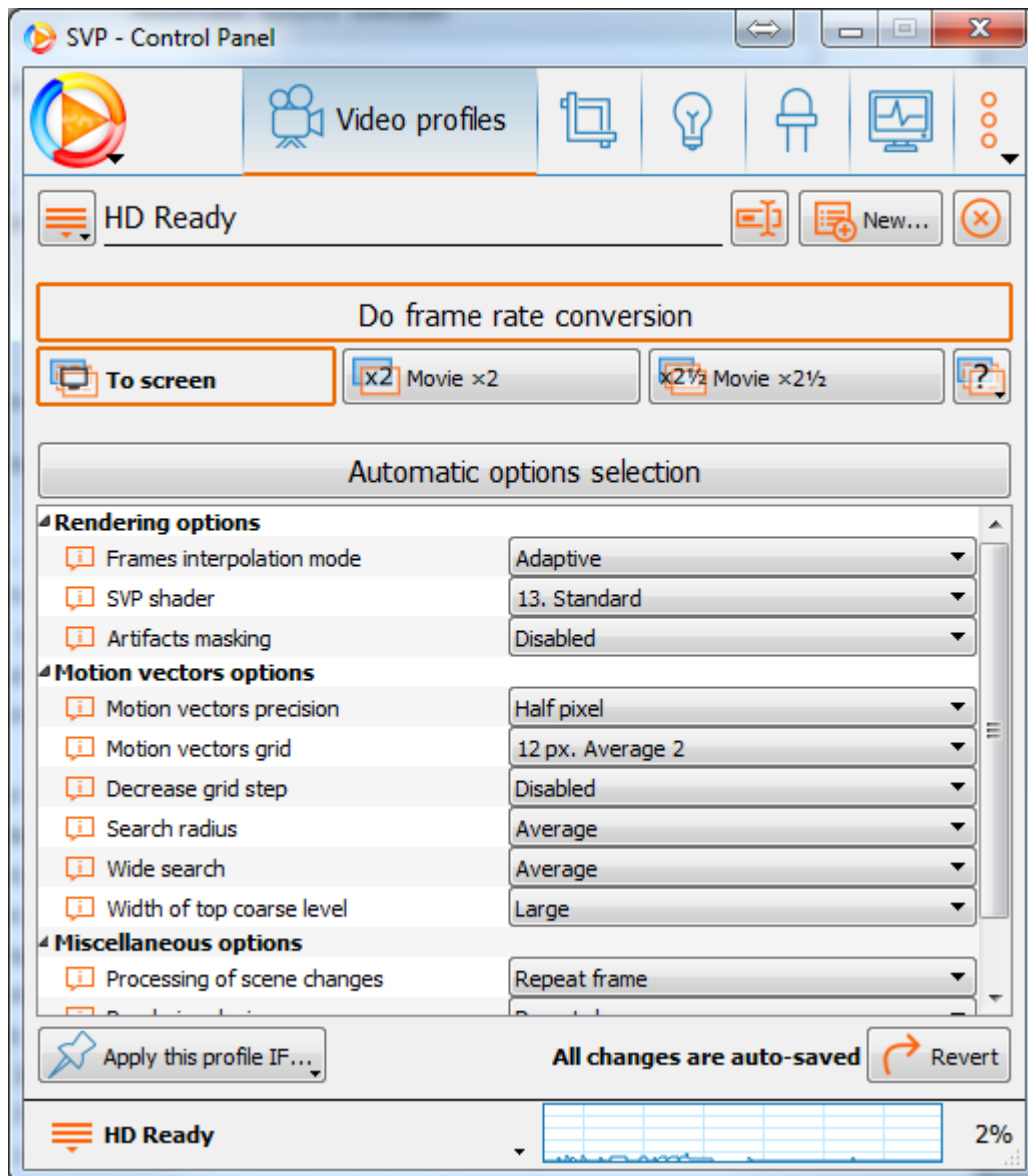
It is important to understand that you should find a balance between the video smoothness and the number and visibility of artifacts (visible errors) in the calculated intermediate frames. Greater smoothness always results in more noticeable artifacts, and the reduction in the number of artifacts always reduces smoothness. There is no perfect set of options that gives maximum smoothness without artifacts.

In the manual mode, the following options are available:

- **Rendering options** – options of this group affect the creation of an interpolated frame based on the already deduced motion vectors ("motion compensation"). Most of this work is performed on GPU and does not affect the CPU load.

- **Frames interpolation mode** – defines the ratio of the number of source frames to the number of interpolated frames. The lower the number of interpolated frames are inserted, the lower the smoothness is, but also the lower number of artifacts are introduced.
  - **2m (min artifacts)** – the minimum number of interpolated frames. For example, if the frame rate is increased up to 2.5 of the original rate, each original frame is repeated twice.
  - **1m (average mode)** – each original frame is used once.
  - **1.5m (less artifacts)** – similar to the **1m** mode, but the interpolated frames are closer in time to the original frames, which reduces the visibility of artifacts.
  - **Uniform (max fluidity)** – uniform interpolation gives the greatest possible smoothness, but in some cases (a non-integer coefficient for increasing the frame rate) results in most frames being interpolated thus increases artifacts visibility.
  - **Adaptive** – automatic mode selection for every frame, depending on the quality of the deduced motion vectors. In the scenes, which are difficult to analyze, the smoothness will decrease.
- **SVP shader** – an algorithm for interpolated frame calculation that uses two or more source frames and the deduced motion vectors:
  - **1. Fastest (slow PCs)** – the fastest algorithm that is useful for systems with slow CPU and without GPU.
  - **2. Sharp (anime)** – this algorithm gives sharp images, because it does not blend neighboring frames; recommended for hand-drawn animation.
  - **11. Simple Lite** – an algorithm with simple blending of frames based on the motion.
  - **10. By blocks (CPU only)** – this algorithm uses simple blending, but performs motion compensation by image blocks rather than by pixels. It runs noticeably faster than the others if GPU is not used.
  - **21. Simple** – this algorithm uses simple blending and applies masking, which helps reduce halos around moving objects and at frame edges.
  - **13. Standard** – a variant of **11th** algorithm, without masking, but giving more smoothness with some increase in the visibility of artifacts.
  - **23. Complicated** – an algorithm with the most complex masking.
- **Artifacts masking** – additional masking of possible distortions of the frame areas with unreliable motion vectors. These areas can be overlaid with the areas of the original frames with some degree of transparency. The stronger the masking is, the blurrier image and the worse smoothness will be.
  - **Disabled** – no masking is used;
  - **Weakest**, **Weak** – the optimal values will be used;
  - **Average** – can result in appearance of specific artifacts, for example, triple edges;
  - **Strong**, **Strongest** – the maximum values will be used; not recommended for use.

- **Motion vectors options** – the options for the search of motion vectors ("motion estimation"). All the options of this group significantly affect the CPU load.
  - **Motion vectors precision** – a higher accuracy in the search for motion vectors increases the smoothness of slow motion such as slow moving closing credits on a black background. High accuracy dramatically increases the use of RAM, especially if no GPU is used. For example, for playing back a video of **Ultra HD** format, more than 5 GB of RAM might be required for high accuracy.
  - **Motion vectors grid** – the motion vector search algorithm works with small blocks of the video frame. The smaller these blocks are, the more likely you'll find motion of small objects, with more wave artifacts noticeable at the edges of objects.
  - **Decrease grid step** – additional refinement of motion vectors while reducing block sizes twice.
  - **Search radius** – the range of motion vector search, limits the maximum length of the vector and the degree of "fluidity" of the image. The larger the radius is, the more likely you'll get a wrong vector, resulting in more interpolation artifacts.
    - **Small and fast** –- does not allow using the more resource-intensive SADT function to compare image blocks;
    - **Small, Average, Large.**
  - **Wide search** – a last attempt to find the motion vector with a larger radius in case if regular search did not provide a good enough result.
  - **Width of top coarse level** – for hierarchical search of motion vectors, at different levels different search options are used – particularly, at the last levels (the largest ones), more simple options are used to reduce the CPU load. The smaller this value is, the larger number of high levels will have the lower options.
- **Miscellaneous options**
  - **Processing of scene changes** – the method of creating intermediate frames at the moments of scene change, that is, when there are no motion vectors available:
    - **Blend adjacent frames** – intermediate frames are created using simple blending of two frames; this results in smooth transition between scenes;
    - **Repeat frame** – intermediate frames are copies of original frames; this results in instant scene change.
  - **Rendering device** – allows using a GPU device different from the one specified in the Main menu.
  - **Processing threads** – an addition to the **Processing threads** value set in the Main menu. The number of calculation threads directly affects how much RAM will be used.
- **User defined options** –- arbitrary options that you can add via the **Application settings** section in the Control Panel and then use in the **JavaScript** code. See the "Management of the script generation" section.

Using a Profile

Once the video starts playing back, SVP selects the most appropriate profile and calculates the intermediate frames by using the profile options. For automatic profile selection, SVP uses the conditions specified in each profile (see the "Conditions for applying the profile" section).

To use the settings from a specific profile, select the profile from the **Profile for an active video** menu. You can access this menu in one of the following ways:
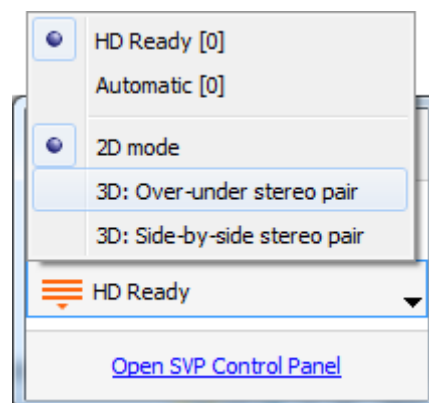
1. Locate it in SVP Main menu.
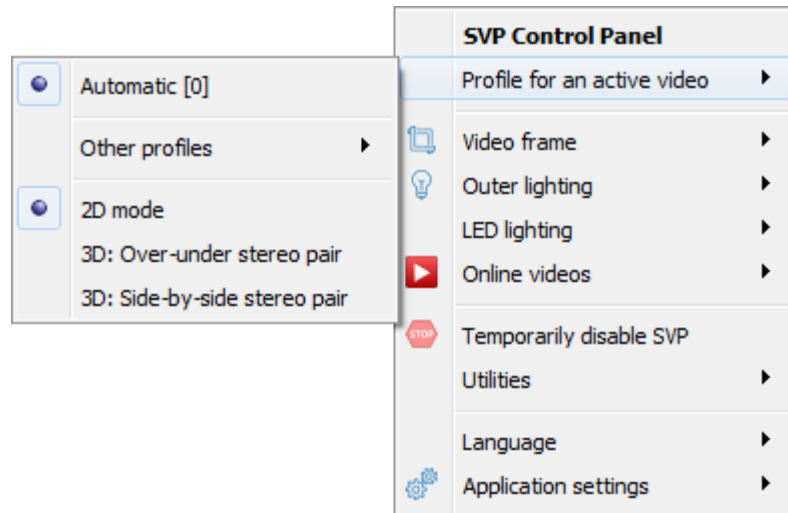
2. Click the profile name at the bottom of the Control Panel window.
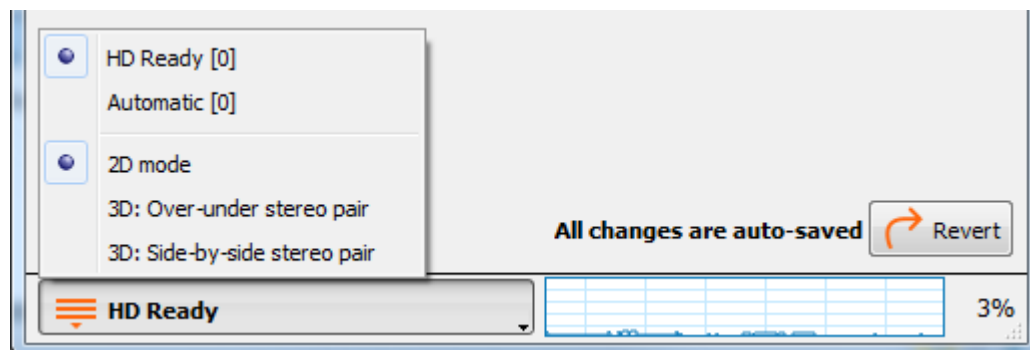
3. Left-click the SVP icon in the notification area.

Also, use the **Cycle to the next video profile** keyboard combination (see the "Hotkeys" section) for cyclic switching of matching profiles.

Conditions for Applying the Profile

A profile is considered as a matching one for a video if all the conditions specified in this profile are met. A profile with no conditions specified matches any video, for instance, the default **Automatic** profile.
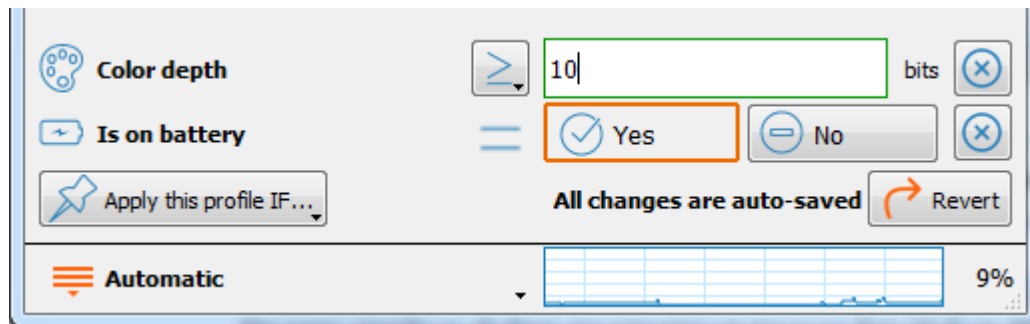
Example: This profile will be used only for 10-bit (HDR) video when the computer is on battery.

If a video meets the conditions of several profiles, the profile with the largest number of conditions is applied (for more details, see the description of the condition **Expert: add scores**).

Each condition consists of three elements: the "object", "relation" and "value". For example: "frame width", "greater than", "1000 pixels", or "file name", "contains", "star wars".
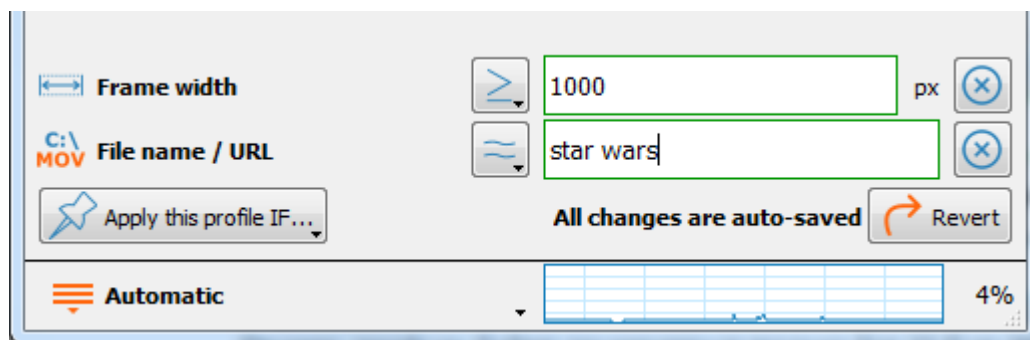
To add a condition, click **Apply this profile IF** button, select the "object" in the list and specify both "relation" and "value". If you add a condition to the profile during a video playback, actual value is automatically placed into the "value" field, otherwise the field remains empty.
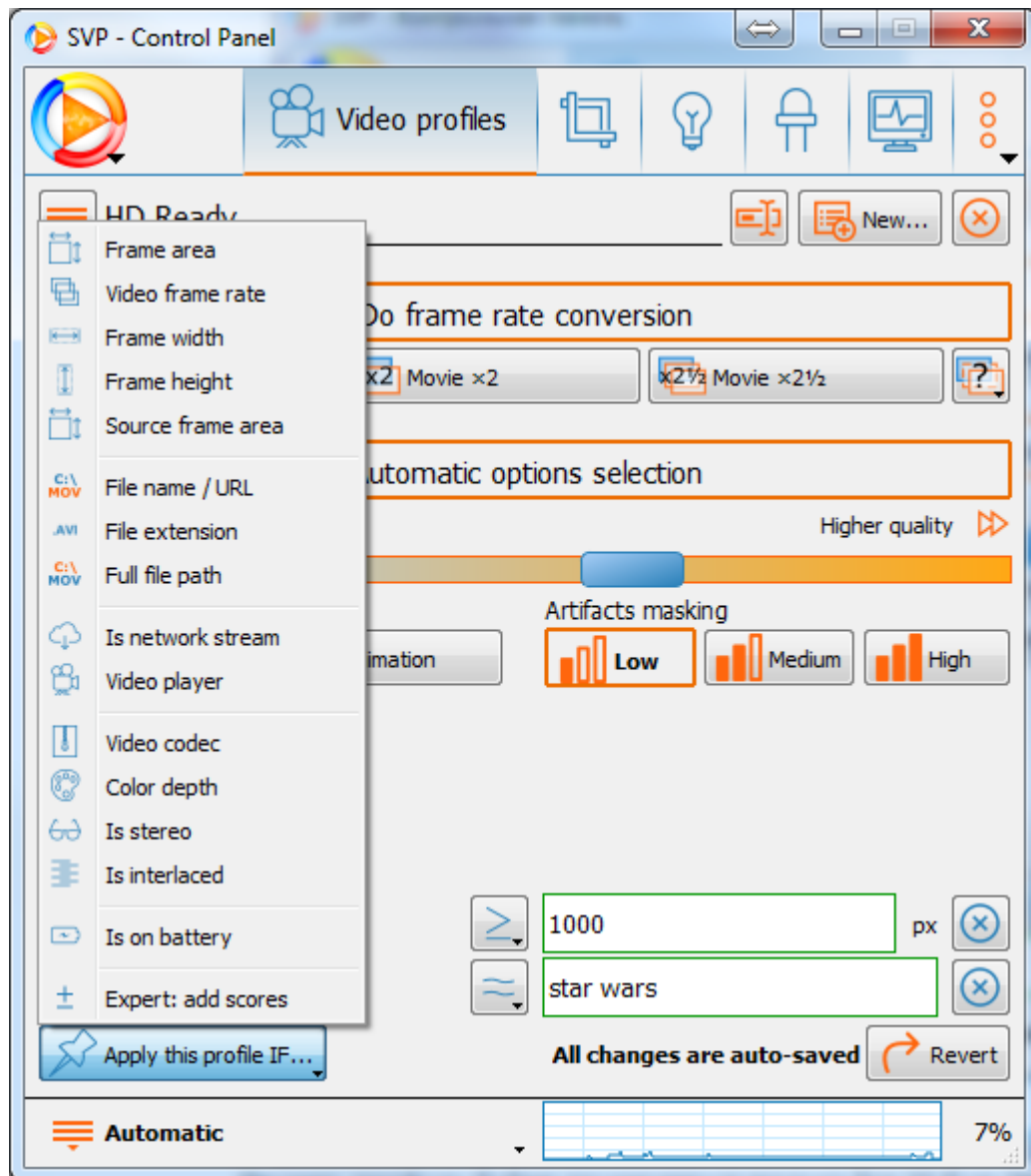
You can set conditions for the following "objects" and "relations".

- Basic video options:
    - **Video frame rate** – the original frame rate, is greater or less than a value specified, expressed in frames per second.
    - **Frame width** – the frame width after cropping and scaling, is greater or less than a value specified (pixels).
    - **Frame height** – the frame height after cropping and scaling, is greater or less than a value specified (pixels).
    - **Frame area** – the frame area (i.e. width*height) **after** cropping and scaling, is greater or less than a value specified (megapixels = millions of pixels).
    - **Source frame area** – the frame area **before** cropping and scaling, is greater or less than a value specified (megapixels).
- Names and paths:
    - **File name / URL** – the file name or **URL** (in case of a video stream playback through a network) is equal to or contains a specified string. The string can be a regular expression (see below).

- o **File extension** – the file extension is equal to a specified string. The string can be a regular expression.
- o **Full file path** – the full path to a file contains a specified string. The string can be a regular expression.
- Video sources:
  - o **Is network stream** – the video is a network video stream, yes or no.
  - o **Video player** – the full path to the video player executable file contains a specified string. The string can be a regular expression.
- Additional video options:
  - o **Video codec** – the video codec (for example, "**avc**" or "**h264**") is equal to a specified string. The string can be a regular expression.
  - o **Color depth** – the video color depth is greater or less than a value specified in bits (for example, 8 bits or 10 bits).
  - o **Is stereo** – the video is in 3D (stereo) format, yes or no.
  - o **Is interlaced** – the video is an interlaced video (for example, DVD or **1080i**), yes or no. Such video requires pre-deinterlacing by the video player.
- Computer state:
  - o **Is on battery** – the computer runs on battery power, not AC, yes or no. Portable systems often have reduced performance when running on battery.
- Other:
  - o Each condition (that is met) from the profile's list adds a certain number of points to the profile score; the score is shown next to the profile name in the profile selection menu. The more points a profile has, the higher priority it has. A profile with the highest score is selected when a video playback starts. **Expert: add scores** allows you to add any number of points to a profile score to accurately define the profile priority in "disputable cases" when several profiles equally match the video (have the same score).

As string "values", you can use regular expressions which are enclosed by "\" characters. For example, "\mp4|mkv\" – a regular expression, meaning a string which is equal to "mp4" OR "mkv". For in-depth description of regular expressions in use, see **Qt's QRegExp** manual.

General Options

General options, that affect the frame rate conversion function, are set in the Main menu and do not require frequent changing.

The **Application settings** menu:
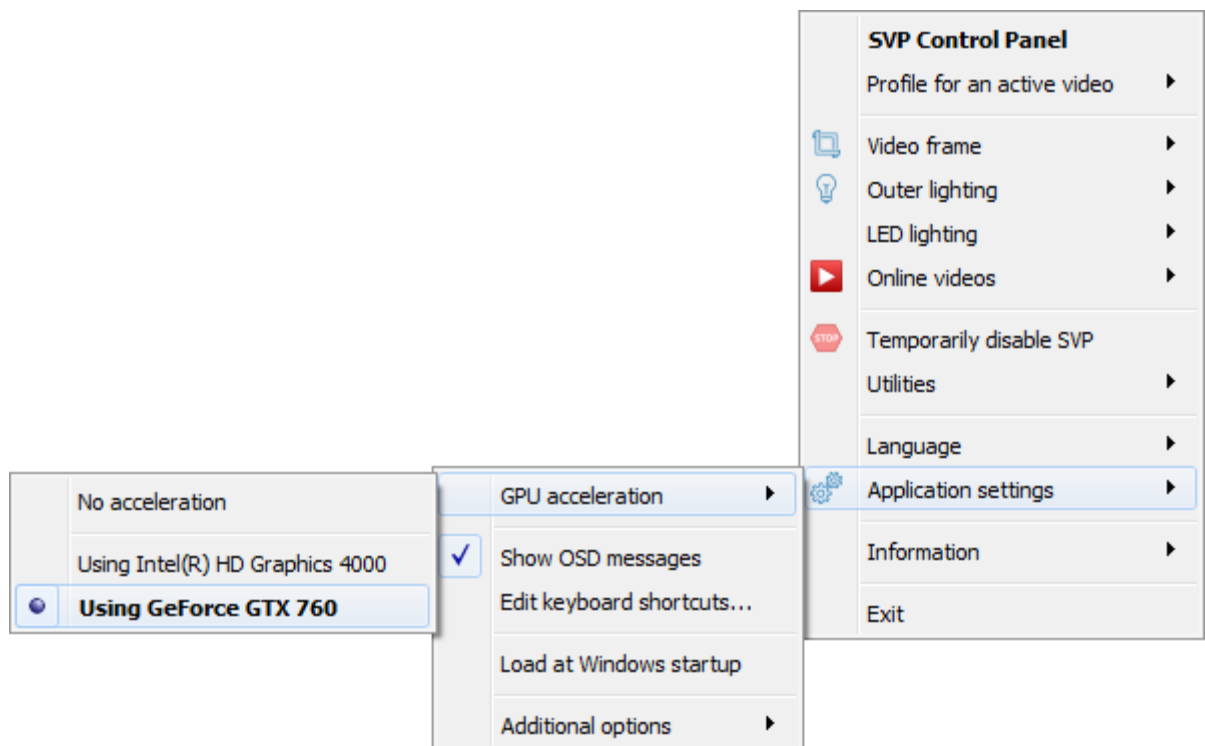
- **GPU acceleration** – selection of GPU device for use in intermediate frame calculation. This option can be overridden by the video profile.
  - **No acceleration** – no GPU is used. This reduces the calculation quality and significantly increases the CPU load.
  - **Using <video card name>** – use the specified GPU. For systems combining both dedicated and integrated GPUs, you should select the dedicated GPU if the integrated one performs poorly. On the other hand, in laptops, using an external GPU can degrade battery life and increase heating.
- **Additional options**
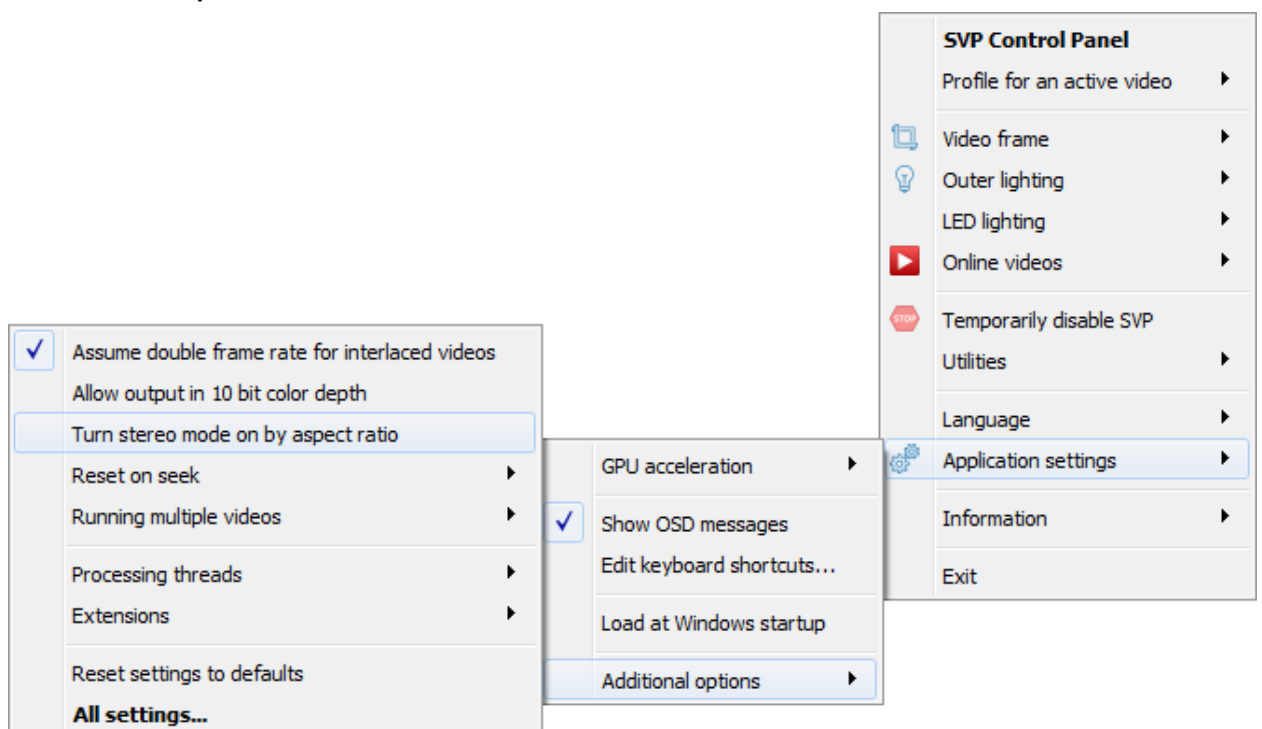
- o **Assume double frame rate for interlaced videos** – SVP does not work with interlaced video (DVD, 1080i); such video must be preliminarily converted to progressive format. This conversion is usually performed in a video decoder. Depending on the conversion algorithm, from the original **50i / 60i** video you can get either **25p/30p** or **50p/60p** video. By using this option, you inform SVP which algorithm you select – with or without frame rate doubling.
- o **Allow output in 10-bit color depth** – allow processing of 10-bit videos without losing quality. Available only in video players based on **mpv** or **VLC**. If this option is disabled, the intermediate frame calculation will be always performed in 8-bit color depth, even for a 10-bit sources.
- o **Running multiple videos** – SVP can process multiple videos at the same time; you can select them in **Profile for an active video** menu:
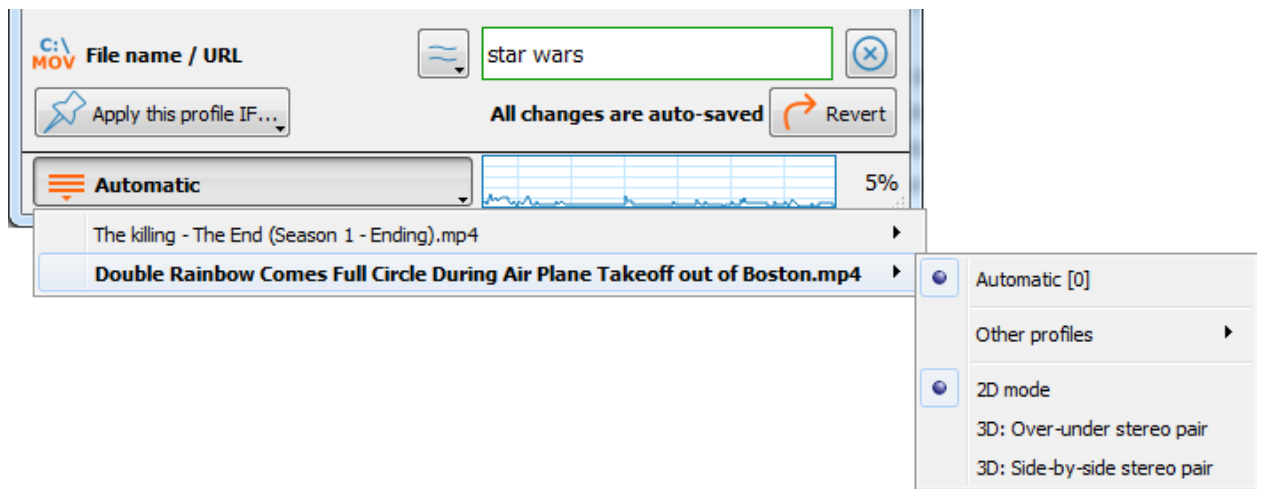
- ▪ **Use SVP in all opened videos** – process all the video at the same time.
- ▪ **First opened video only** – process only the first opened video. All other videos will be ignored until the first one is closed.
- ▪ **Latest opened video only** – process only the last opened video. SVP work in previously opened videos will be stopped.
- o **Processing threads** – number of calculating threads. Higher values allow better use of the CPU, but require more RAM. Do not set values other than **Auto** if you are unsure why you are doing this. This option can be overridden by the video profile.

Resizing an Image

The cropping function allows you to remove black bars from the video frame or to adjust the video frame size to the screen size.

The image scaling function changes the size of the video frame without changing the aspect ratio (the proportion between the width and the height of the frame).

SVP performs cropping and scaling (even when the frame rate conversion function is off) in the following order:

1. automatic cropping of black bars;

2. cropping to the specified aspect ratio;

3. scaling.

Image Cropping

Image cropping changes the aspect ratio of the video and discards part of the original image. Cropping is necessary for:

1. Getting rid of black bars on the video edges. Black bars inside the video frame interfere with the frame rate conversion function, as they increase the CPU usage and result in wave gray artifacts appearing at the frame edges.

2. Adjusting the video to the screen size. For example, in case you play back an old 4:3 video on a modern widescreen TV.

To crop an image:

1. Open the SVP Main menu, the **Video frame** submenu.
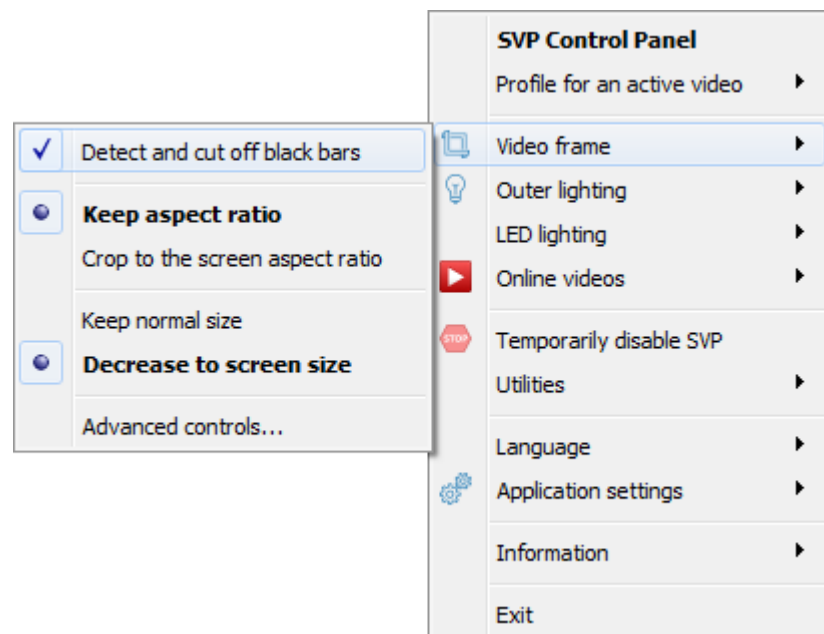
2. If you want SVP to automatically detect black bars at the frame edges and cut them off, select **Detect and cut off black bars**.

3. If you want to crop the video to completely fit your screen, select **Crop to the screen aspect ratio**. In this case, too large part of a visible image can be lost. Cropping is not applied if you select **Keep aspect ratio**.

4. Select other modes and additional cropping options in the **Frame size** section of SVP Control Panel, which opens when you select **Advanced controls.**
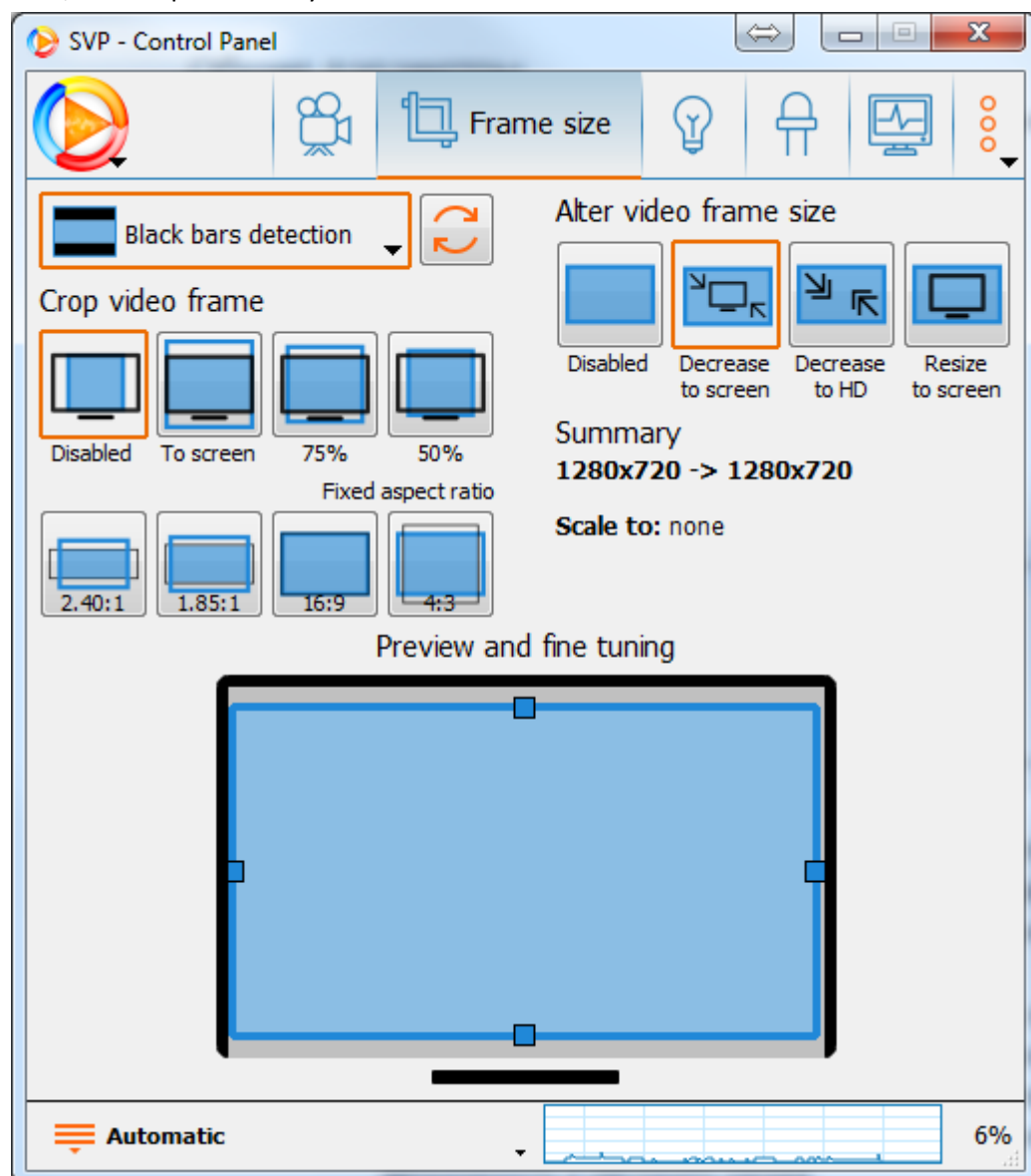
During video playback, a blue frame is displayed over the image, indicating the area of the frame that will remain after the cropping is done.

5. Hold the **Black bars detections** button to select one of the **Black bars detection** modes:
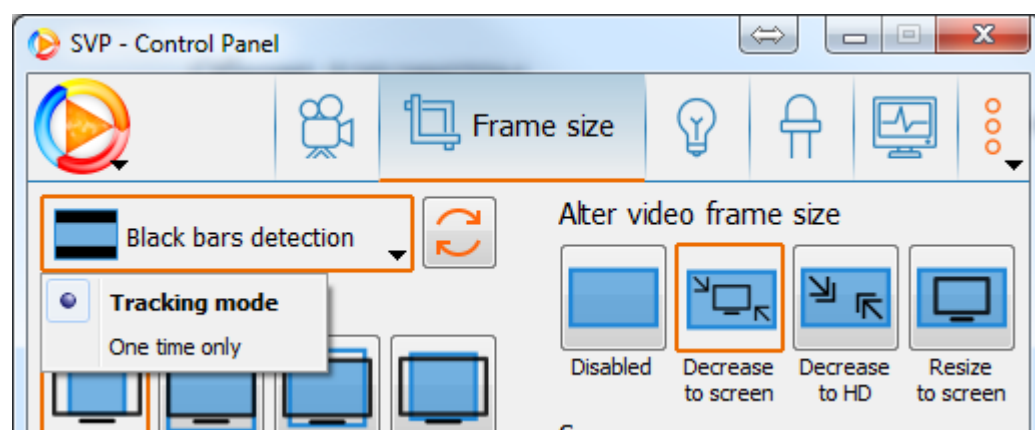
- o **Tracking mode** – the black bars detection is performed continuously; if a change is detected, the cropping mode will be immediately changed. This mode can be used for

video with a variable aspect ratio (for example, **IMAX** versions of movies), but frequent switching can detract you from watching the video.

- o **One time only** – the detection of black bar is performed only once to exclude mode switching during playback. To force a repeat detection, click the **Force re-detect black bars** button, or press the same hotkey.

6. Select the options for the cropping to the specific aspect ratio in the **Crop video frame section**:

- o **Disabled** – any cropping is disabled (similarly to **Keep aspect ratio** in the Main menu).
- o **To screen** –- to crop the video to screen aspect ratio, similarly to **Crop to the screen aspect ratio** in the Main menu.
- o **75%** or **50%** – select one of these values to crop the video to the screen aspect ratio by **75%** or **50%.** Such cropping approximates the frame aspect ratio to the video aspect ratio. This compromise between disabled cropping and cropping to the screen aspect ratio allows you to increase the screen filling without losing too much of the visible image.
- o **2.40:1**, **1.85:1**, **16:9**, **4:3** – select one of these values to crop the video to the fixed screen aspect ratio.
- o To specify a custom value, use the "**frc.frame.crop**" parameter in the **Application settings** section of the Control Panel.

7. The selected cropping mode is schematically shown on the **Preview and fine tuning** diagram. To change the cropping borders during video playback, drag the markers over the diagram to the desired positions.
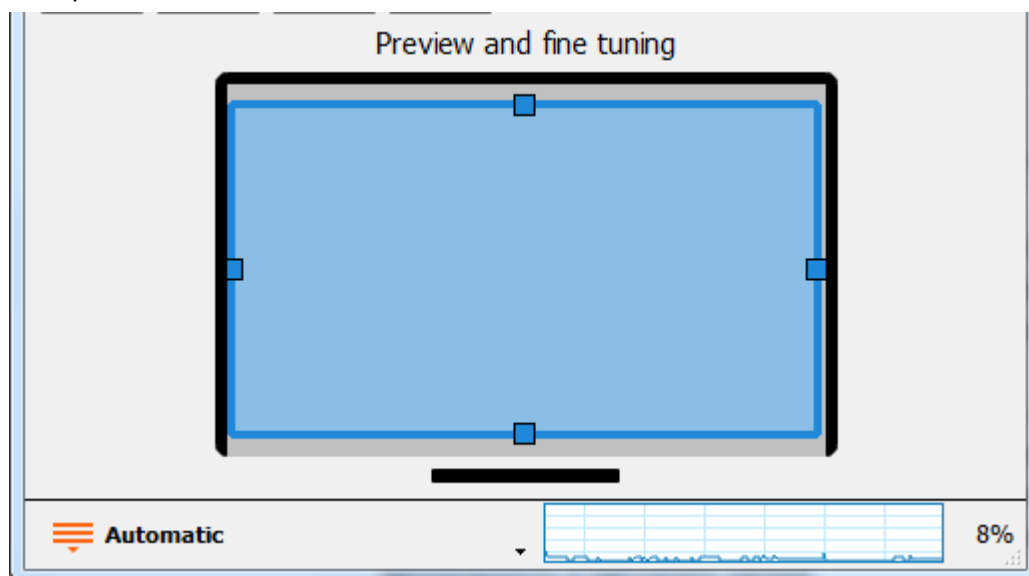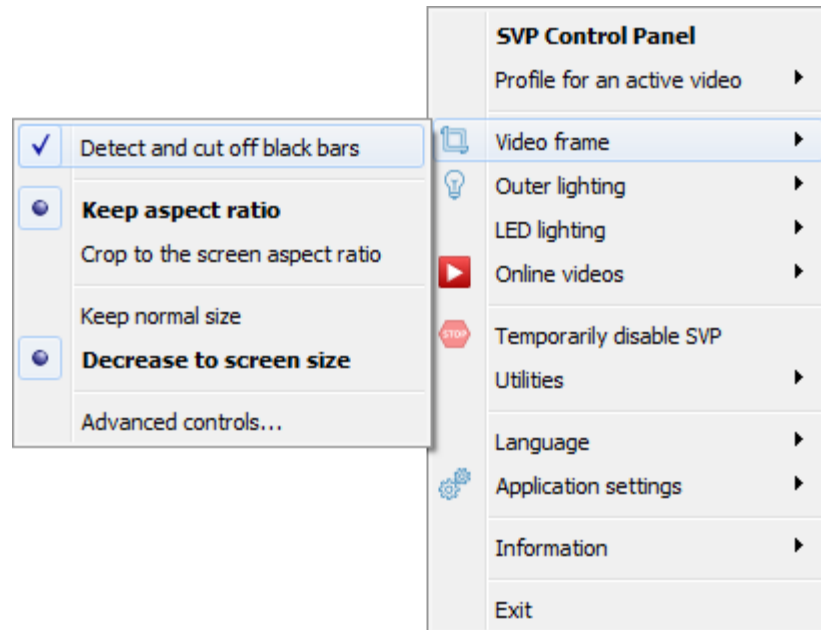
Image Scaling

Frame scaling is used to reduce the CPU load when the frame rate conversion function is active. For example, scaling can be used if the video frame size is larger than the screen size measured in pixels. Preliminary reduction of the frame size made before the calculation of intermediate frames allows using higher-quality parameters for this calculation.

To scale an image:

1. Open the SVP Main Menu, the **Video frame** submenu.

2. Select the scaling mode:
   - **Keep normal size** –- does not scale the image.
   - **Decrease to screen size** –- reduces the image to the screen size. If the image size is already smaller than the screen size, scaling is not performed.
3. If you need to choose another scaling mode, select **Advanced controls** in, which open the **Frame size** section of SVP Control Panel.

   Select the image scaling mode in the **Alter video frame size** block:
   - **Disabled** –- to disable scaling (similar to **Keep normal size** in the Main menu).
   - **Decrease to screen** –- to reduce the frame to the screen size (similar to the option in the Main menu).
   - **Decrease to HD** –- to reduce any video to a width of 1280 and/or a height of 720 pixels. This option can be used for systems with poor performance that do not have enough power to calculate quality intermediate frames for high-definition video.
   - **Resize to screen** –- to scale the image up or down to fit the screen size. Unlike the **Decrease to screen** mode, this mode also increases the frame size if the frame size is smaller than the screen size.
   - To select another mode, use the "**frc.frame.resize**" parameter in the **Application settings** section of the Control Panel.

Black Bars Outer Lighting

Outer lighting fills an unused black bars at the edges of the image if the video aspect ratio does not match the screen aspect ratio.

Comparison of different lighting modes:

Unlike cropping (see the "Image cropping" section), which removes a part of the image, lighting creates a new image. If the video contains black bars within the frame, then lighting should be combined with cropping of black bars as follows:

    1. First, find and crop the black bars within the video frame.

    2. Then, add outer lighting so that the frame would have the same aspect ratio as your screen.

SVP can fill black bars even when the frame rate conversion function is off.

To manage lighting of the black bars:

    1. Open the SVP Main menu, **Outer lighting** submenu.
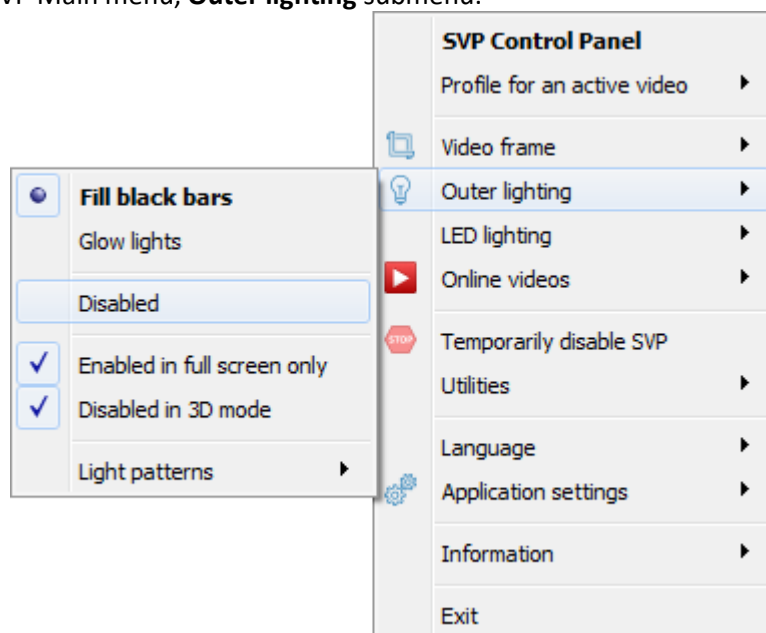
2. Select the lighting mode:
    o **Fill black bars** – to light only the top and bottom or right and left bars depending on the video and screen aspect ratios.
    o **Glow lights** – to light all four sides of the image.
    o **Disabled** –- to turn off the lighting.
3. Select additional options for black bars lighting:
    o **Enabled in full screen only** –- to enable lighting only when the video player is in full-screen mode, and disable when the video is shown in a window.
    o **Disabled in 3D mode** –- do not use lighting for 3D video playback.
4. A set of options ("pattern") defines the lighting visual appearance. Select the lighting pattern from the **Light patterns** list. You can add and modify a pattern in the **Black bars lighting** section of the Control panel, which opens when you select **Manage patterns.**
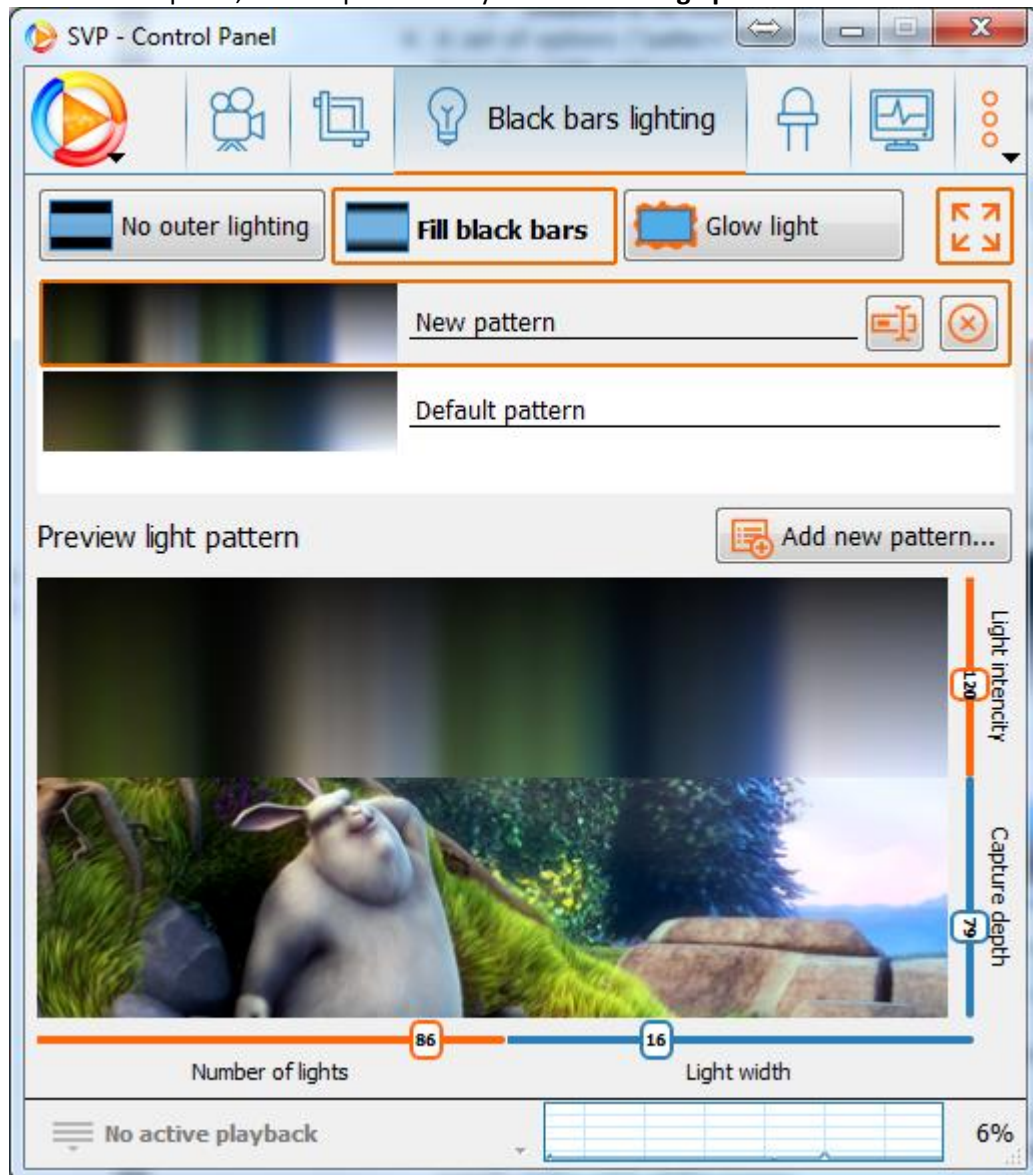
The lighting pattern includes the following options:
- **Number of lights** –- a number of light sources at the edges of the video frame. The smaller number gives more uniform lighting.
- **Light intensity** –- the brightness of light sources, that is, how far they "shine", as percentage of the black bar height. 100% means that with a completely white frame, the lighting will go black exactly at the edge of the screen.
- **Light width** –- the width of color averaging along the frame edge.

- **Capture depth** – the depth of color averaging inside the video frame. The bigger value gives more gray lighting.

When switching to another active pattern or changing the pattern options, the image of the lighting in the preview area changes accordingly.

The **Default pattern** contains the default option values and cannot be modified or deleted. To add a new pattern, click the **Add new pattern** button; the values of the active pattern will be copied to a new one.
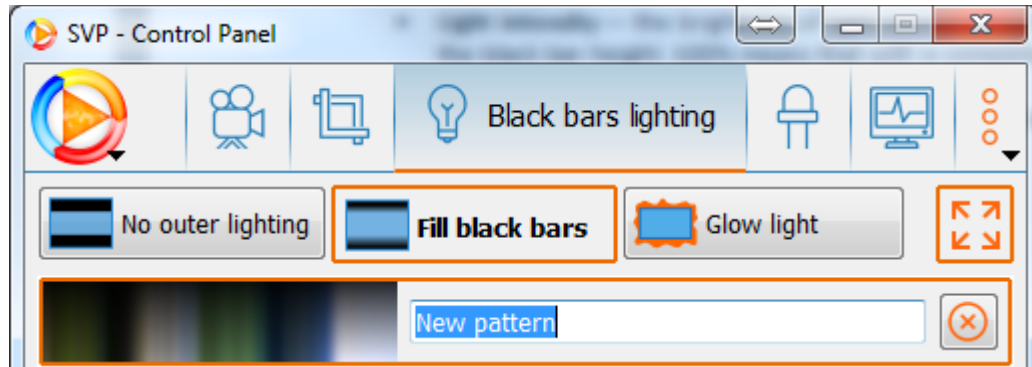

To rename any pattern (except for **Default pattern**) click **Rename this pattern** and delete it by clicking **Delete this pattern**.

SVPtube - Online Video Playback

SVPtube allows you to open video from many websites, such as YouTube, Crunchyroll, Twitch, and more. SVPtube uses the **youtube-dl** program, and if **youtube-dl** does not support videos from some website, SVPtube will fail to work with such videos either.

The best video player for online video is **mpv** player, because it's the only one that supports all formats of video, audio, and subtitles used on various sites. Second best are **MPC-HC** and **MPC-BE**. Other video players can be more suitable for specific sites.

To add SVPtube, select it during the installation of SVP, or install it using the **Maintain SVP 4** application (see the "Additional Components" section). In SVP 4 Mac, it is necessary to mark the Main menu option **Application settings → Additional options → Extensions → svptube.**
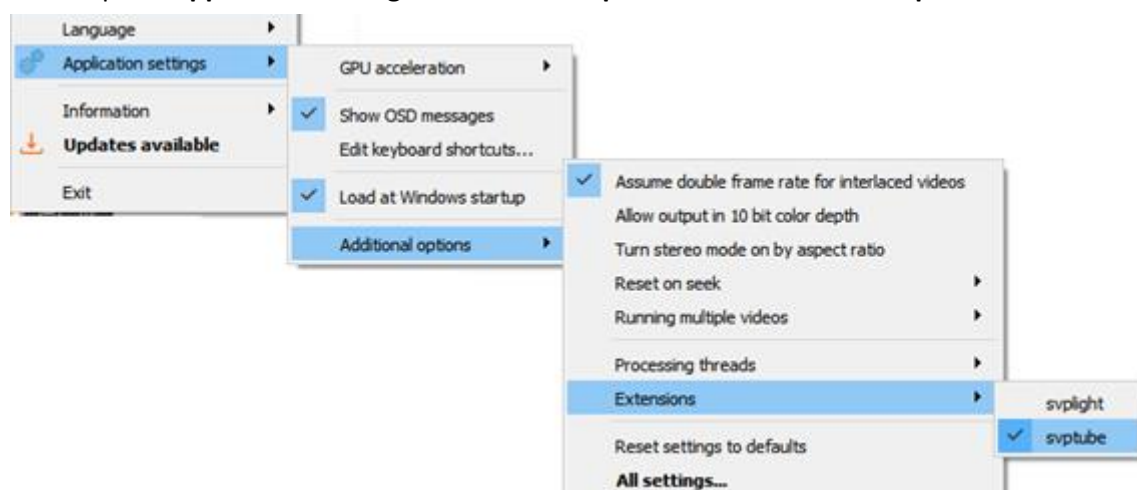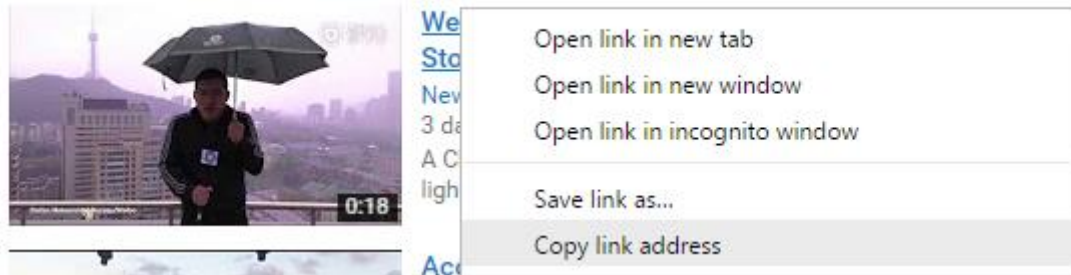

After that, the **Online videos** option is displayed in the SVP Main menu, and you will find a separate SVPtube icon in the notification area.
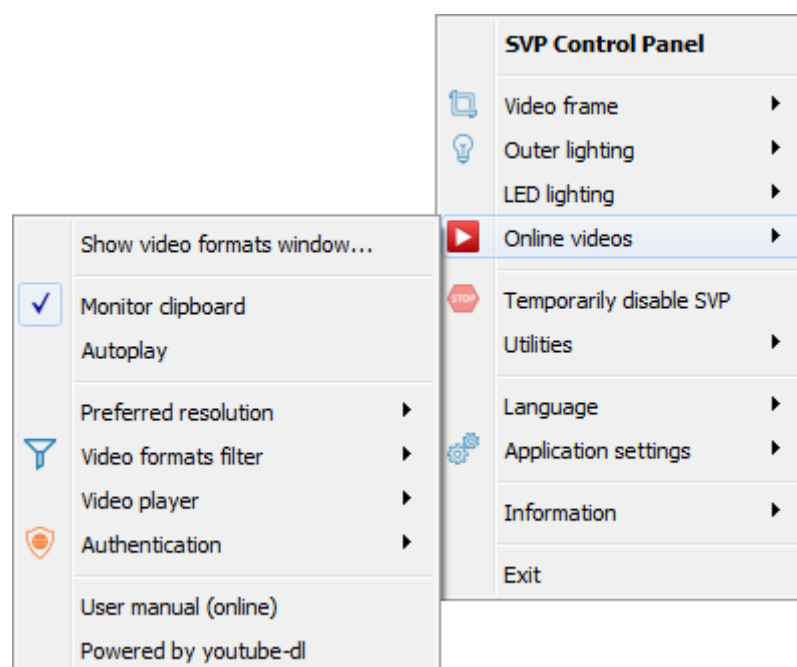
You should pre-install **Python 3.6** and **ffmpeg** on computers running macOS or Linux.

SVPtube Usage

On any supported website, copy the address of a clip or playlist to clipboard by using the context menu.


In different browsers, the menu option you need can be named differently:

- Google Chrome: **Copy link address**
- Mozilla Firefox: **Copy link location**
- Microsoft Internet Explorer: **Copy shortcut**
- Apple Safari, Microsoft Edge: **Copy link**

After that, SVPtube performs the following actions:

1. Analyzes the address (URL). If the website is not supported by **youtube-dl**, nothing will happen.
2. Gets all the necessary information about the video – available video and audio formats, subtitles languages, etc. In some cases, this may take up to 20 seconds. For some websites, which require registration or a paid subscription to watch the video, you must specify the authorization data in the settings (see the "Authorization on websites" section).
3. Displays a window near the notification area, showing playlist contents (if any), available media formats and subtitles languages. In case the **Autoplay** function is enabled, the window is not displayed; instead, the most preferred video format is automatically selected. Otherwise, you need to click the **Play** button to start playing the video.
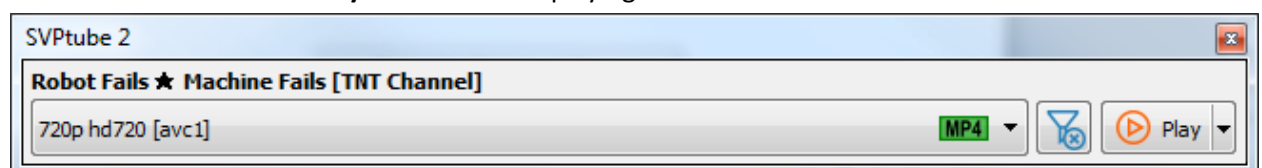
4. Launches the video player that is specified in the settings.
5. Hides the window. You can open it later by any of the following actions:
   - Click SVPtube icon.
   - Select SVP Main menu → **Online videos** → **Show video formats window.**
   - Use the **Show SVPtube window** keyboard shortcut.
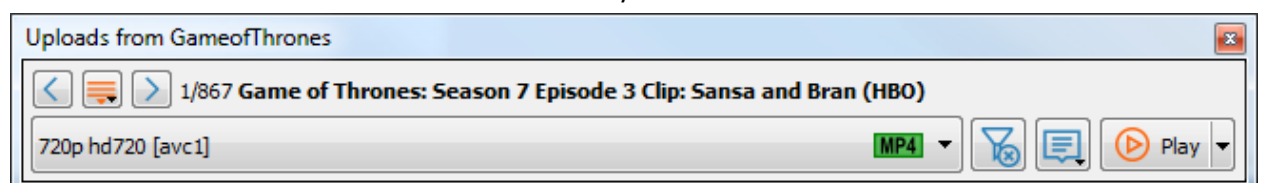
The SVPtube window contains the following items:

- The title of the playlist (if applicable).

- Playlist navigation items:
    - A navigation button to the previous video in the list. Also see the **Previous video in SVPtube playlist** keyboard shortcut.
    - The **Table of Contents** button.
    - A navigation button to the next video in the list. Also see the **Next video in SVPtube playlist** keyboard shortcut**.**
    - The position of the selected video in the list, for instance, 3/18.
- The title of the video.
- A filtered list of available media formats. Some other options can be listed here, depending on the website, such as frame size (height), codec type, bitrate, DASH format (i.e., separate video and audio tracks), and frame rate.
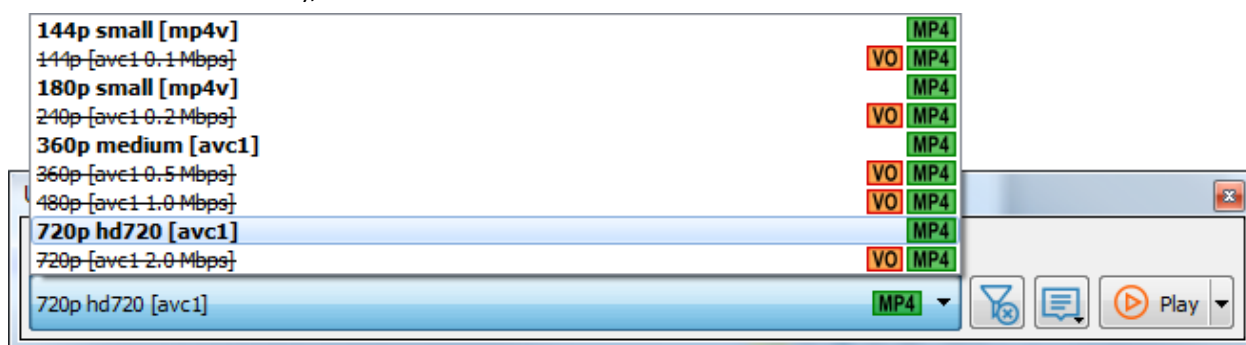
- The **Show hidden formats** button to ignore all media format filters specified in the settings. After clicking the button, all available formats will be displayed in the list.
- A button for selecting the language of subtitles, if any. SVPtube remembers the last selected language.
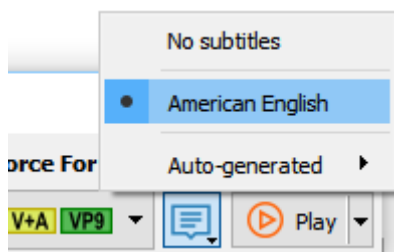
- **Play** button to start playback in the selected video player.
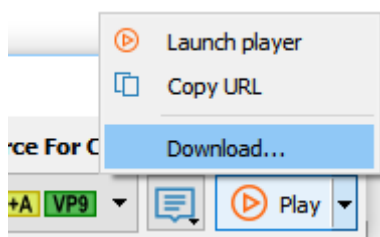
In addition, the following menu functions are available:

- **Copy URL** – to copy the direct link to the stream (which is in the selected format) into the clipboard.
- **Download** – to start saving video to disk. This function requires the **ffmpeg** program installed.

SVPtube Setting

To automate the use of SVPtube, specify the following settings:

- preferred video formats;
- which video player should be used;
- the data needed for authorization on websites.

The configuration is performed by using the **Online videos** submenu of the SVP Main menu as follows:
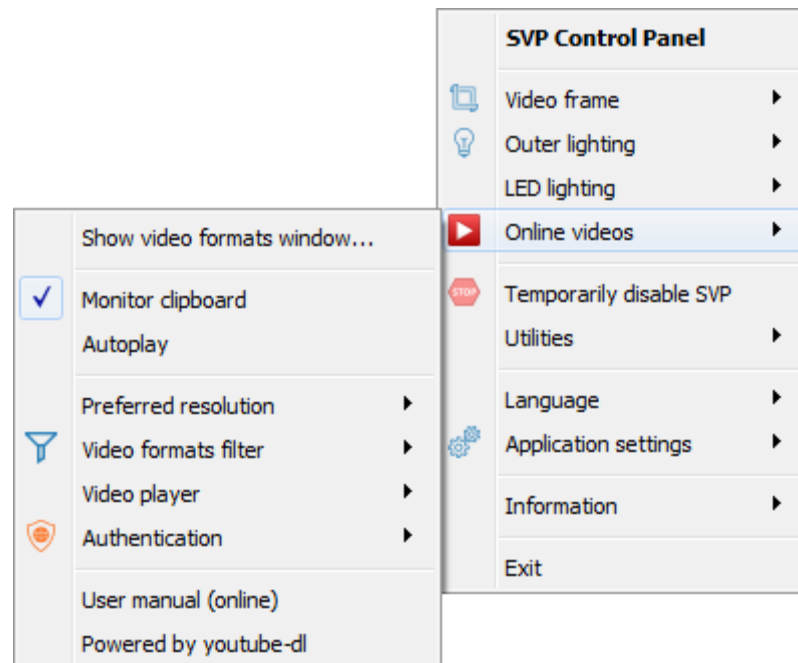
Monitor clipboard – to turn off the clipboard monitoring, thus disable SVPtube.

Autoplay – to enable or disable automatic playback of the preferred video format, immediately after the address has been copied to clipboard.

To specify the preferred video formats, use the following submenus:

- **Preferred resolution** – to specify the preferred height in pixels. "2K" corresponds to a frame height of 1440 pixels, "4K" corresponds to a height of 2160 pixels. SVPtube will automatically select the video size closest to the selected value.
- **Video formats filter** – to select filters that hide specific video formats:
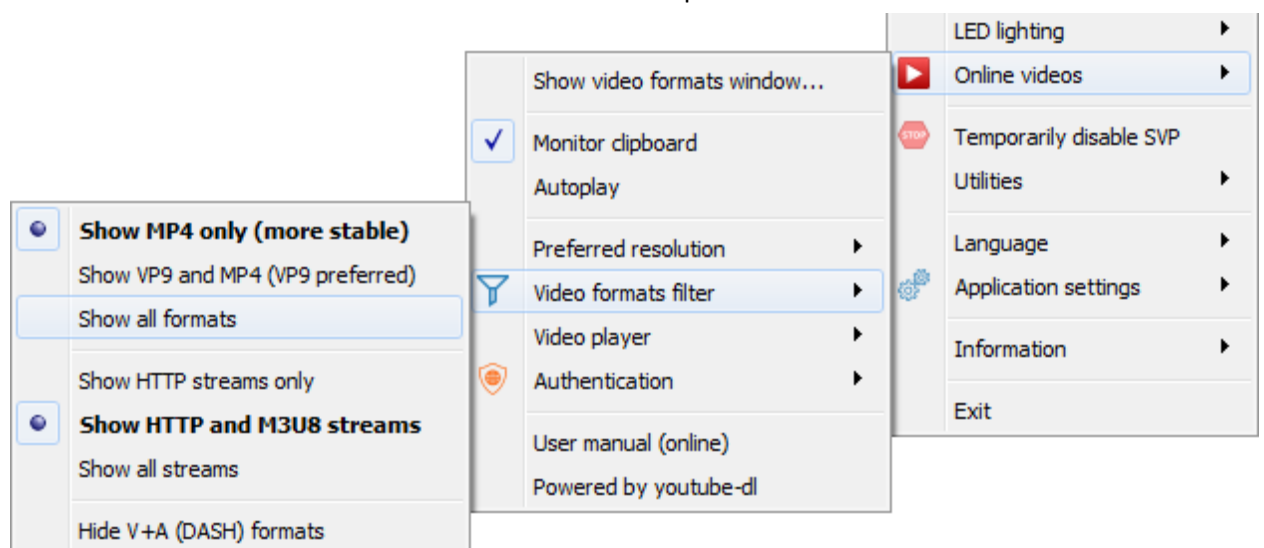
- o **Show MP4 only** – to show only the videos in a MP4 container, which is supported by all video players.
- o **Show VP9 and MP4** – to additionally show the videos which are encoded with the **VP9** codec (**WEBM** container). On YouTube, the **VP9** formats perform better than **MP4**, but **VP9** hardware decoding is only available on the latest generation video cards.
- o **Show all formats** – to turn off filtering by codec. Non-recommended formats, such as **FLV,** will also be shown.
- o **Show HTTP streams only** – to show only those video streams that are available directly via **HTTP** protocol. All video players support such streams.
- o **Show HTTP and M3U8 streams** – to additionally show **HTTP** video streams in **M3U8** format. Some video players, such as **MPC-BE**, do not support this format.
- o **Show all streams** – to turn off filtering by protocol. Some websites do not provide video via **HTTP**. The **RTMP** protocol is only supported by the **mpv** player.
- o **Hide V+A (DASH) formats** – to hide the video streams containing just video or just sound, which is typical for YouTube. To play back such a video, the player must be able to combine two data streams, video and audio. This playback mode is only supported by **MPC-HC (MPC-BE), mpv** and **VLC**.

To select the video player that will be launched by SVPtube by default, select one of the options in the **Video player** submenu:

- **System default** – to select the video player, registered in the system to open **MP4** files.
- **mpv player** – to select the **mpv** player bundled with SVP.
- **Choose application** – to select an arbitrary executable file, to which a direct links to the media streams will be sent as arguments.

To use a specific video player on a specific website:

- Copy address of any video clip on this website to clipboard.
- Wait for SVPtube to analyze the video and show its window.
- Open **Player for site** submenu in the **Video player** menu and select one of the following options:
  - o **Same as for all web sites**
  - o **mpv player**
  - o **Choose application**

Authentication – to specify options for authorization on various websites; allows you to add authentication data for the last visited website, or delete previously added data.

Authorization on Websites

Some websites may require pre-authorization to allow access to all or some videos: in a web browser, the user must enter a username and password to be able to access personal or paid videos. Some websites only work with users from certain countries; access to other websites can be blocked in some countries.

In all these cases, some additional actions are required to watch the video. If SVPtube shows an error indicating the restriction of access to the video, select **Authentication → Add web site authentication data** from the menu.

You do not need to fill in all the fields, just specify the data that is required for access. Most often, specifying the **User name** and **Password** is enough.

If a two-factor authorization is enabled on the website, each time a new code is received, you need to type it in the **two-factor code** field.

To bypass regional restrictions, you can use a proxy server by specifying its address in the **Proxy server** field. For HTTP/HTTPS servers, the protocol can be omitted. To use SOCKS server, you need to specify a fully qualified URL, for example, "socks5://127.0.0.1:1040".

If a simple proxy server does not allow you access the website, you should consider using a VPN, which is beyond the scope of this manual.

Some sites, such as Crunchyroll, use protection against various network attacks, that is why you can access the website only after additional request checking. As the result, the website sends cookies – information that is stored on the user's computer – which will be required for further requests.

To enable SVPtube to work with such a website, you need to import these cookies to SVP from web browser. For this:

1. Open the website in a web browser; log in using your user name and password.
2. Export **cookies** for this site to a text file in the **Mozilla/Netscape** format. For Google Chrome and Mozilla Firefox, there are add-ons that can create such a file "in one click."
3. Load this file into SVPtube by clicking the **Load from text file** button.

4. Identify your web browser's "**User-Agent**" string. For this, click the **Find out** link and copy the entire string shown on the website opened. Paste this string into the **User-Agent** field.

By default, SVPtube does not save authentication data, and next time you start SVP, you will need to re-enter it. If you want to save this data permanently, select the "**Yes, I want SVP to save this password locally**" option; your passwords will be stored in encrypted form, however, with a low level of protection.

Saving Video to Disk

To save (download) a video from a website to a disk you need the **ffmpeg** program. In Windows, you need to add the **SVPtube 2 video downloading** package using the **Maintain SVP 4** program (see the "Additional Components" section), and in macOS or Linux you need to install **ffmpeg** manually.

To save a video clip to your computer local disk:

1. Copy the address of the video clip to clipboard.
2. Wait for SVPtube to analyze the video and show the format selection window.
3. Open the additional menu of the **Play** button and select **Download**.
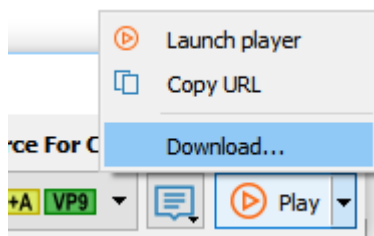
4. Specify the path for saving the video to the computer disk.

The SVPtube window will show the progress of video downloading, and the icon in the notification area will change its color.
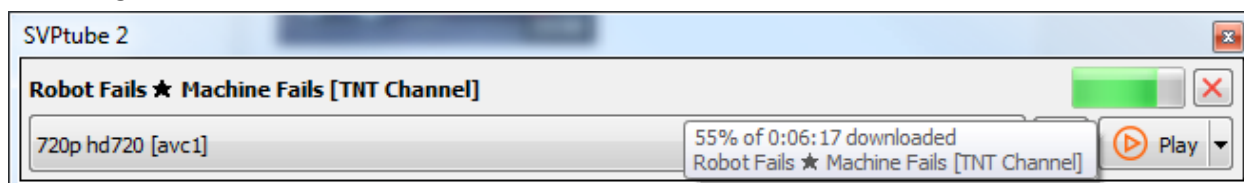

While downloading, you can navigate to another video clip. Moreover, you can start downloading of the 2nd video, in which case it will be added to the download queue. To cancel saving the current video, click the **Cancel download** button – download of the next video from the queue (if any) will start.

SVPlight - Ambient LED Lighting

SVPlight is a program for managing LED ambient lighting equipment similar to **Philips Ambilight**, for example, **Lightpack**.

If you have not added SVPlight during SVP installation, you can install it later using the **Maintain SVP 4** application (see the "Additional Components" section). In SVP 4 Mac, it is necessary to mark the Main Menu option → **Application settings** → **Additional options** → **Extensions** → **svplight.**
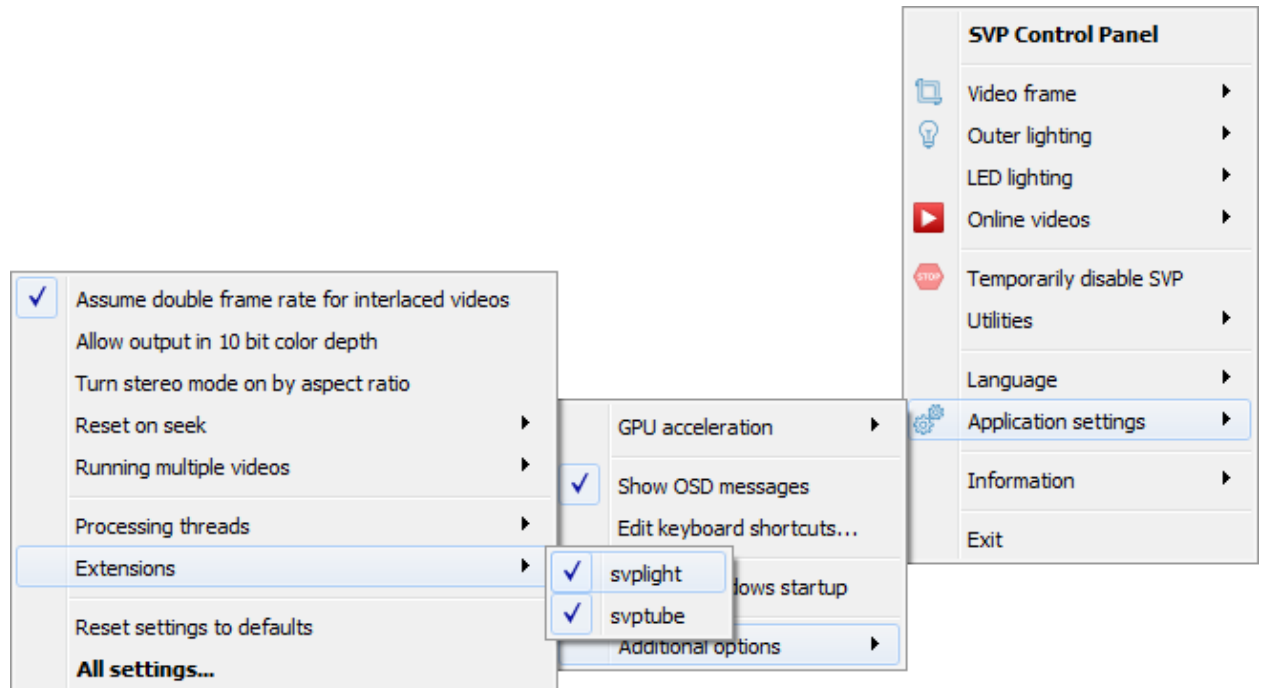
If SVPlight is installed, the **LED lighting** option appears in the SVP main menu.

Connecting the Equipment

SVPlight is compatible with **Lightpack** and **Paintpack** devices, as well as with **Prismatic** and **Ambibox** programs that are commonly used to control various LED equipment.

To enable SVP to operate your equipment:

1. Connect the equipment to the computer, attach the LEDs to the monitor or TV.
2. If needed, run the control program (**Prismatik** or **Ambibox**) and configure the equipment (see the **Prismatik** and **Ambibox** operation manuals).
3. Select the **Setup hardware** option in the **LED lighting** menu of the SVP Main Menu. The **LED hardware** section will open.
4. Select the type of equipment and how it is connected:
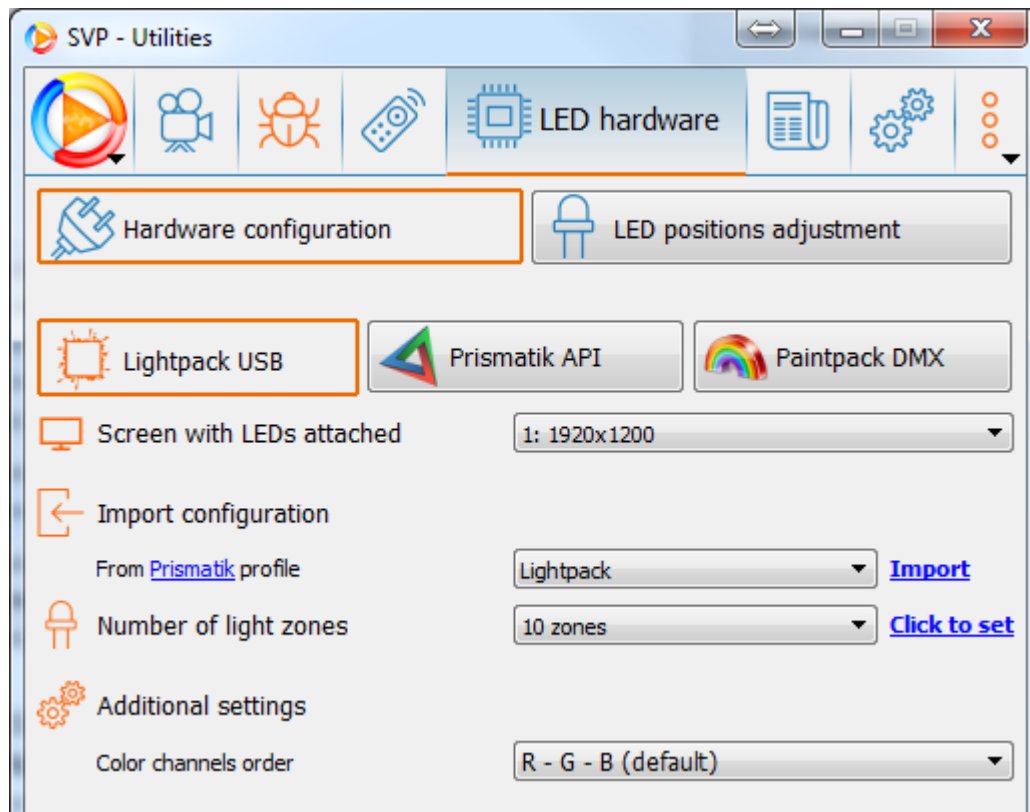
- o **Lightpack USB** – direct control of **Lightpack** devices**,** without using the **Prismatik**.
- o **Prismatik API** – control of LED equipment with the help of either **Prismatik** or **Ambibox** program.
- o **Paintpack DMX** – direct control of **Paintpack** devices.
5. If multiple monitors are connected to the computer, select the one to which the LEDs are attached from the **Screen with LEDs attached** list.
6. Select the number of LEDs and the order of color channels and click **Click to set**. You can also import these settings from **Prismatic** or **Ambibox** by selecting corresponding profile name from the list and clicking **Import**.
7. If everything is connected correctly, LEDs will turn on and the **LED positions adjustment** section will open.

8. Adjust the exact position of LEDs attached to the monitor or TV. A colored triangle on the diagram corresponds to each LED, and the LED shows the same color. You need to drag each triangle to the correct place in the diagram. To make it easier, you can turn on fullscreen mode by clicking the **Toggle full screen mode** icon. To quickly verify that the specified locations are correct, click **Turn running lights effect on or off**.

Using LED Lighting

To turn on LED lighting, select **Turn on** in the **LED lighting** submenu of the SVP Main Menu. This can also be done by using the **Toggle LED lighting** keyboard shortcut.
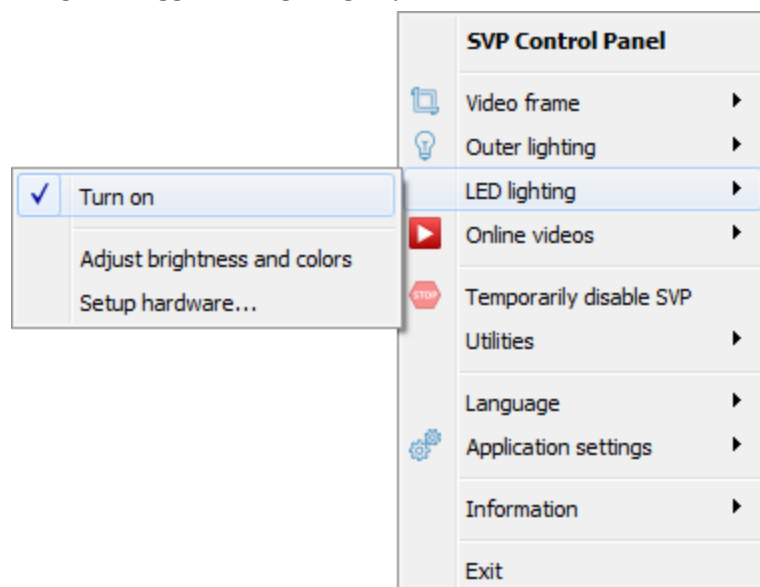
The lighting will turn on automatically when the video playback starts and will turn off after the player is closed or playback paused.

For comfortable video watching with background LED lighting, it is important to accurately configure it. The lighting should not distract from watching the video and switch the attention to the lighting itself. To configure the lighting during video playback, select **Adjust brightness and colors** in the **LED lighting** sub-menu – the **LED lighting** section of the Control Panel will open. The following controls are available:
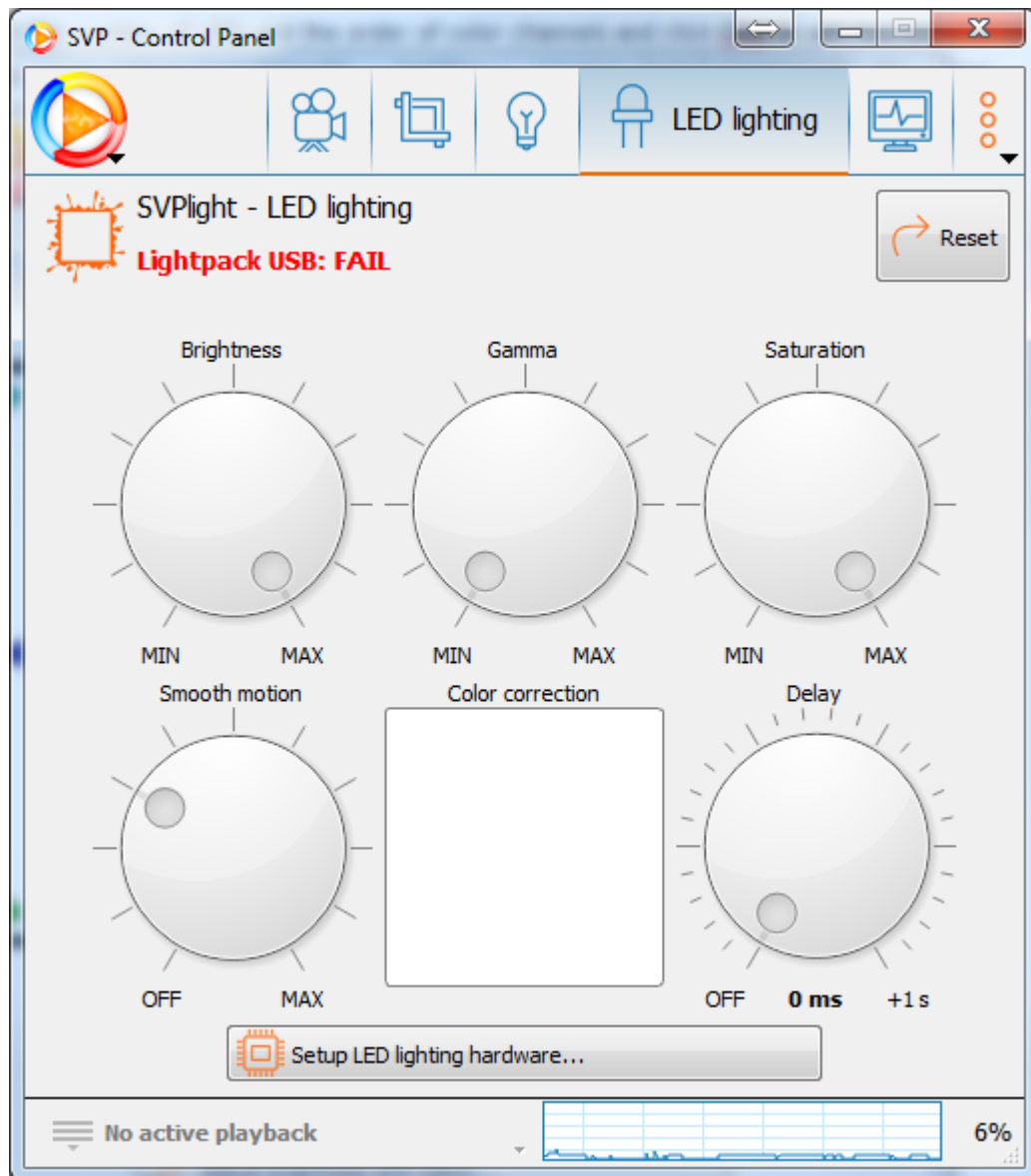
- **Brightness** – changes the overall brightness of the LEDs.
- **Gamma** – determines how the brightness of the LEDs depends on the brightness of the video. Bigger gamma brings more lighting to dark areas of the video.
- **Saturation** – changes the LED colors so that the lower the saturation is, the whitish LED colors are.
- **Color correction** – allows correction of the LED colors if the light hits the colored surface (wall). First, specify the color of the surface (wall) itself. Then adjust the color so that the light on the wall looks as close to white as possible.
- **Smooth motion** – performs smoothing of the light changes over time, defines the speed of the lighting response to changes in the video.
- **Delay** – allows you to choose a delay (in milliseconds) to synchronize the lighting and the video. You may need this because in some cases lighting is triggered earlier than necessary.

3D Video Playback

SVP supports 3D (stereo) video in a stereopair format. Stereopairs can be of two types:
- "Horizontal" or "side-by-side": two images are located from left to right in the frame.
- "Vertical" or "over-under": one image is located above another.

For the proper operation of all functions, SVP needs to determine the type of stereopair. This can be done automatically by the following features:
- Special tags in the file name: "3D", "OU", "HOU", "TB", "SBS", "HSBS" and others. For example: "Some.Move.Name.2017.1080p.SBS.mkv".
- Non-standard video aspect ratio, for example, doubled Full HD format (1920 x 2160, 16:18). You may want to turn off this feature if you have a lot of ordinary (2D) videos with non-standard aspect ratios. To do this, deselect **Turn stereo mode on by aspect ratio** in the **Application settings → Additional options** submenu of the SVP Main Menu.
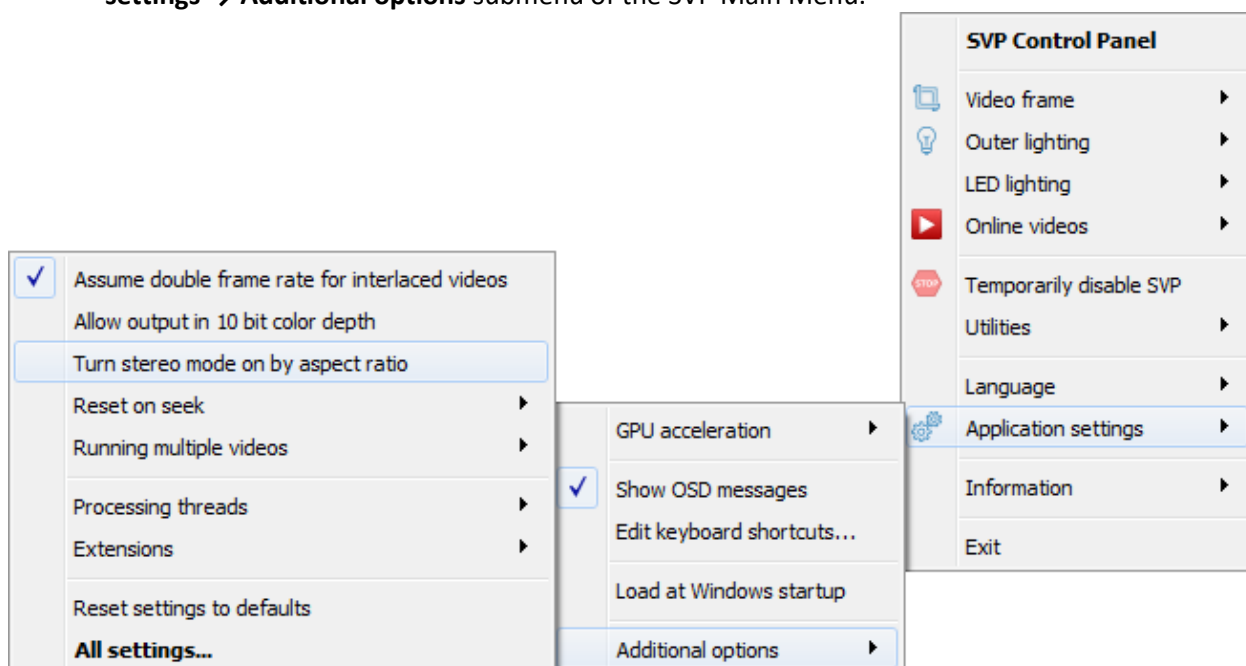
Sometimes, these attributes do not help correctly identify a stereopair type. To manually specify the type, use the bottom part of the **Profile for an active video** menu (for more information, see the "Using a Profile" section) or the **Toggle 3D stereo mode** keyboard shortcut:
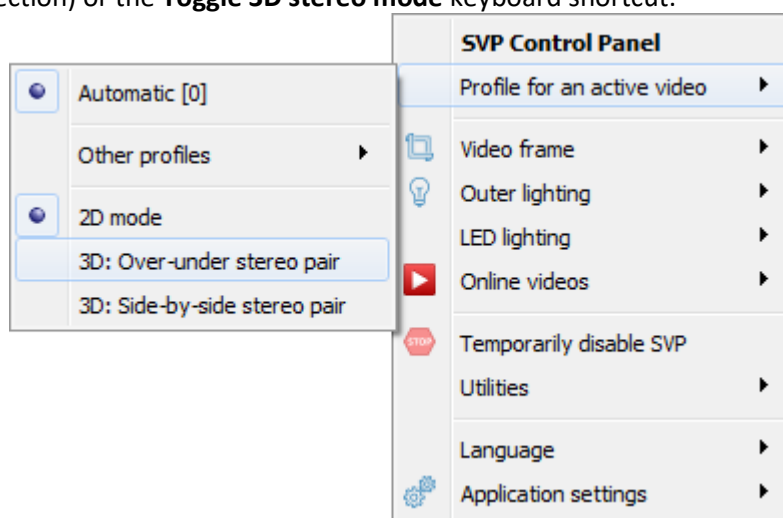
Support for **BD3D (3D Blu-rays)** format is experimental and is currently possible in **Stereoscopic Player** only.

Other Functions

Blacklist of Players

Sometimes, you need to limit SVP operation in some programs. Add such programs to the blacklist.

For example, if the video encoder **FFmpeg** uses **ffdshow** as a video decoder, SVP can interfere with the process which will result in disrupting the **FFmpeg** operation. Therefore, **FFmpeg** must be added to the SVP blacklist.

Some players incorrectly display the video after the frame resizing (as a result of cropping, scaling, or adding black bars lighting). Such players are also added to the blacklist with all SVP functions that change the video frame size prohibited for them while the frame interpolation function is still allowed.

To create a list of players in which SVP using should be restricted:

1. Open the **Control options** section in SVP Control panel.
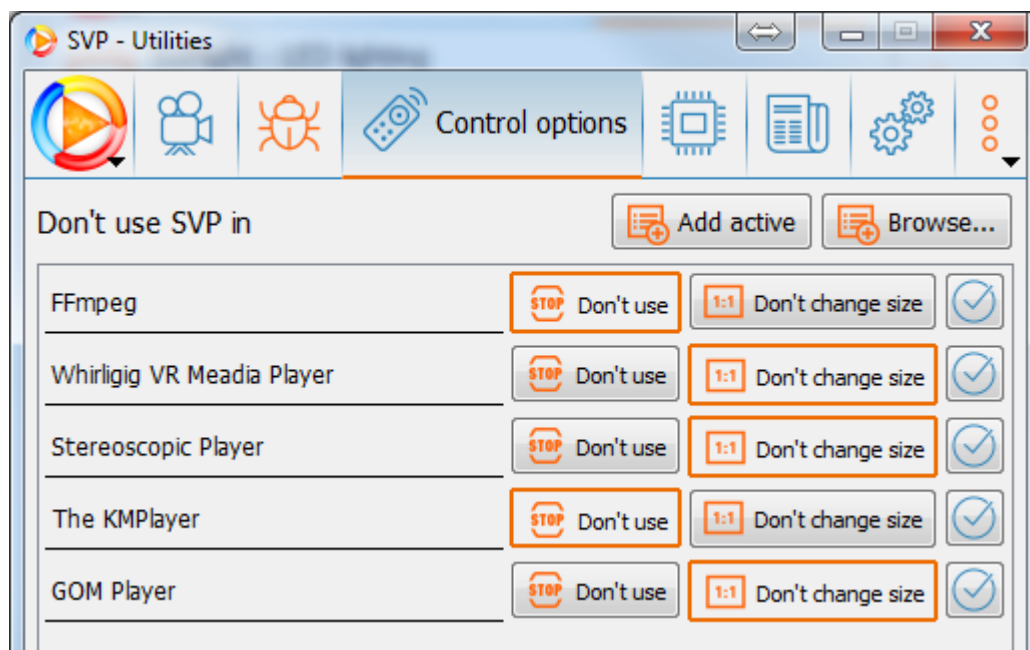
2. To add a program:
   - Start the player and click the **Add active** button during video playback, or
   - Manually select the executable program file by clicking the **Browse** button.
3. Select the restriction mode:
   - **Don't use** – to completely prohibit using SVP.
   - **Don't change size** – to prohibit any SVP functions that change the frame size. The frame rate conversion will still be available.
4. To remove a program from the blacklist, click the **Enable all SVP features in this video player** button.

Hotkeys

Hotkeys are keyboard shortcuts for performing various actions in SVP. Some combinations are available during video playback only.

To view and assign the hotkeys which you can use when using SVP:

1. Open the **Control options** section in SVP Control panel.

   A list of keyboard combinations appears at the bottom of the section. You can disable all the keyboard combinations (for this, click the Off button) or select specific combinations and disable just them.
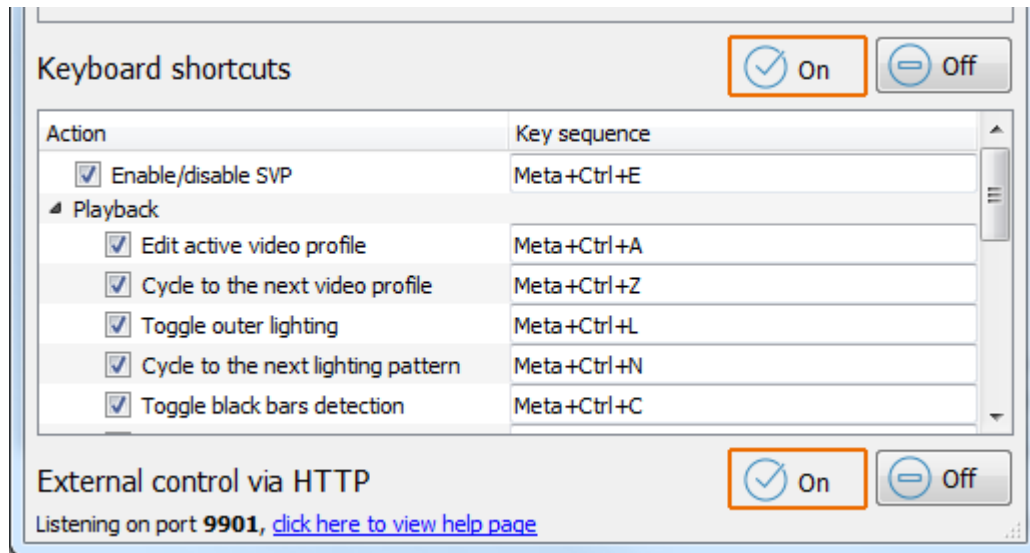

2. Select the action for which you want to change the shortcut:
   - Enable or disable SVP processing;
   - During the playback:
     - Open the **Video profiles** section to edit the active video profile;
     - Switch to the next video profile from the set of matching profiles;
     - Enable or disable black bars lighting;
     - Switch to the next black bars lighting pattern;
     - Enable or disable automatic black bars cutting;
     - Re-analyze the presence of black bars;
     - Enable or disable the last used frame cropping mode;
     - Enable or disable video processing as stereopair.
   - Open **Performance graphs** window;
   - Enable or disable Fluency test, see **Fluency and tearing test** in the Main menu;
   - **Extensions** – shortcuts, specified by additional modules (**SVPtube**, **SVPlight**), see modules description.

3. To change a key combination, click it and then press a new key combination on the keyboard. Note that "**Meta**" means "**Windows key**" in Windows.

Control SVP Remotely

You can control SVP remotely with the help of the **HTTP REST API**. This feature is turned off by default.

To enable remote control, do the following:

1. Open **Control options** section in SVP Control panel.
2. In **External control via HTTP** click **On**, after this, SVP will be awaiting commands on TCP port 9901.
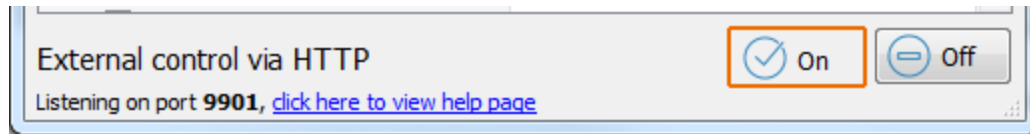
- To view a list of available commands, click the **View help page** link.
- The port number can be changed in the **All settings** section, the "**main.api.port**" parameter.

Advanced SVP settings

You can use the **Application settings → All settings** section in Control panel to view all the SVP options. A large number of options are available for modification from this section only.

WARNING! Do not change options until you are completely sure that you know how this change affects the SVP operation. Arbitrary changing of options can cause disruption of SVP operation.

To reset the SVP options to the default values, select **Reset settings to default** section in **Application settings → Additional options** sub-menu of the Main menu.
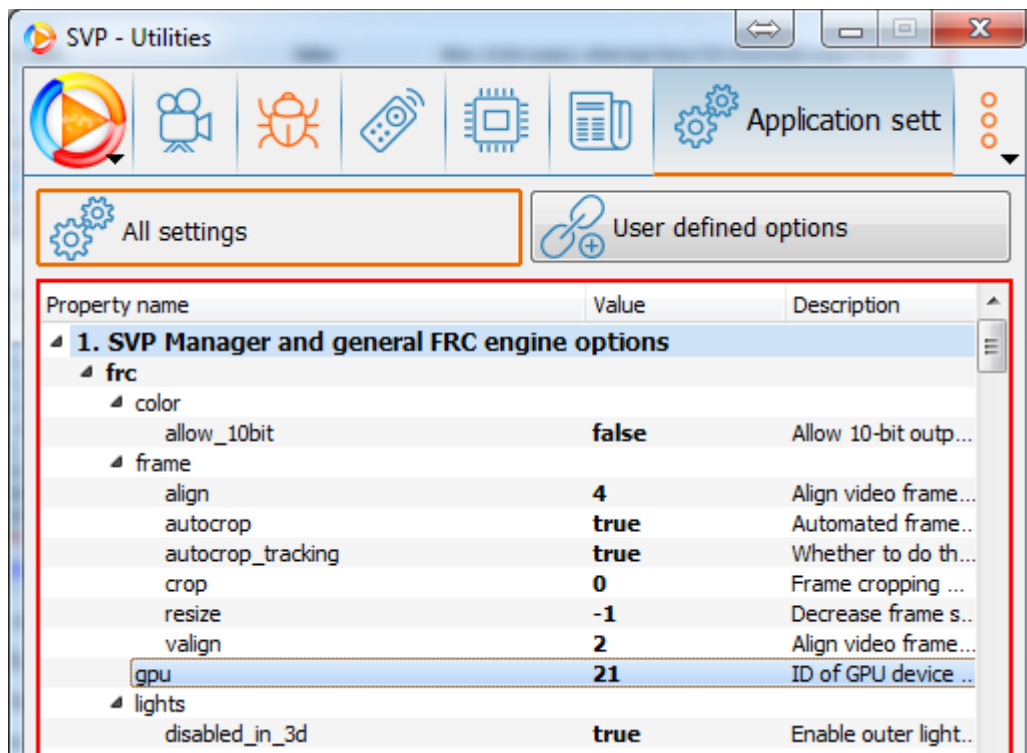
SVP options are distributed between several configuration files. Within each file, options are organized hierarchically, that is, in sets of "sections" and "values"; with some "sections" including other "sections".

The entire hierarchical structure of options is presented as a tree. The top level of the tree contains configuration files. The full name of each "value" includes the names of "sections" in which it is contained. For example, the value "**frc.frame.crop**" is contained in the "**frame**" section of "**frc**" branch, which corresponds to "**frc.cfg**" configuration file.

There are following top-level sections (tree branches) defined:

- "**frc**" – contains options describing the intermediate frames insertion that are used to generate a script for the player (for example, the frame aspect ratio for cropping).
- "**main**" – contains SVP general options (for example, the language and keyboard shortcuts).
- "**reg**" – contains persistent vaules that should be saved after SVP re-installation (in Windows, they are stored in the registry).
- "**rt**" – contains values that are recalculated each time you start SVP (for example, the path to the working directory). Such values cannot be changed manually.
- "**ui**" – contains values that are specific to the user interface (for example, last size of the Control Panel window).
- "**profiles**" – contains a set of profiles. You can save or transfer profiles to another computer by copying the "**profiles.cfg**" configuration file.
- "**lights**" – contains a set of patterns for black bars lighting.
- Some sections used by additional modules, for example "**tube**" for SVPtube and "**leds**" for SVPlight.

Each "value" can be one of the following:

- Numeric – an integer or a floating point number;
- Boolean – "**true**" or "**false**";
- Text string.

To change the "value", click it in the **Value** column, type a new value, and press **Enter**. However, you cannot change the "value" type - for example, you cannot enter arbitrary text for a "value" of the "integer" type.

Management of the Script Generation
WARNING! Please skip this section if you do not know what "JavaScript" or "Avisynth" mean.

SVP operates according to the following algorithm:

1. SVP collects all the necessary information about the system, such as CPU performance, availability of GPU and number of connected monitors with their resolution and refresh rates.
2. Video playback in the player starts.
3. SVP determines parameters of the video playing back – the frame size, codec type, and so on.
4. The necessary video conversion operations (image cropping, scaling, and removing of black bars) are determined.
5. Based on this data, a matching profile is selected, containing options for the frame rate conversion.
6. All the available data including the profile options, conversion options, player data, and some system parameters are passed to the "generator" written in **JavaScript** language.

7. The "generator" creates a program ("script") in the **Avisynth** or **Vapoursynth** scripting language. This script uses the functions of **SVPflow** modules. The script is passed to the video player.

8. The player applies the specified video conversions and inserts intermediate frames by using the built-in **Avisynth** or **Vapoursynth** video filter.

SVP allows you to alter script creation described by Step 7 and perform the following actions:

- directly specify the values of **SVPflow** arguments;
- enter or modify the input variables for the **Avisynth/Vapoursynth** script "generator".

To view the resulting script code, select the **Last generated script** option in the **Information →
Additional information** submenu of the Main menu.

You can add new options (parameters) that will be available either in the **My options** submenu of the Main menu or in the **User defined options** section of the video profile. If you change them, the corresponding values will be passed to the "generator" via additional variables.

To add a custom option:

1. Open the **Application settings** section in SVP Control panel and click the **User defined options** button.
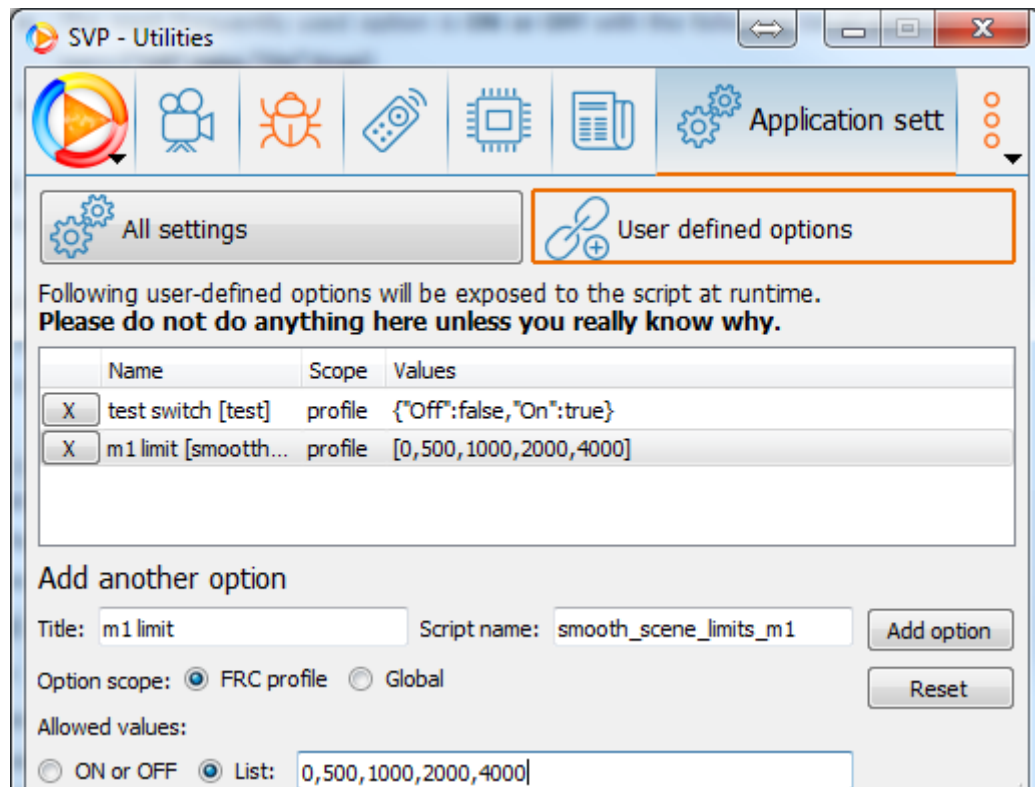
2. Create a new option as follows:

a. Specify an arbitrary name in the **Title** field; this name will be visible in the menu or in the video profile;

b. In the **Script name** field, specify the name of a corresponding JavaScript variable which will be available to the "generator";

c. Select the scope of the option:

- **Global** - if the option should be defined globally for all the video. In this case it will be changed in **My options** section of the Main menu;

- **FRC profile** - if the option should have different values based on video profiles.

d. Specify a list of valid values in the form of an associative array in **JSON** format: **{"Option 1":value_1, "Options 2":value_2,…}**. Then, if you select **Option 1** in the Menu, the appropriate JavaScript variable will be assigned **value_1**, and so on. Examples:

- The most frequently used option is **ON or OFF** with the following list of option-value pairs **{"Off":false,"On":true}**.
- A simple list of option names, separated by commas {**"Option 1","Option 2","Option 3"}** is equivalent to **{"Option 1":0,"Option 2":1,"Options 3":2}**

e. Click the **Add option** button. The new parameter will be added if all fields are filled in correctly. In case of an error, check if the name of the **JavaScript** variable is correct and check syntax of the values list.

3. Modify the "generator" code to enable it to use the new variable. You can modify the following files from the "**script**" subfolder which is in the SVP installation directory:

- **base.avs** and **base.py** – the common parts of scripts for **Avisynth** and **Vapoursynth** respectively, which are directly copied to the final script.
- **generate.js** – the source code of the "generator". The script for **Avisynth** is generated by invoking the "**gen_avs()**" function, while the script for **Vapoursynth** is generated by invoking "**gen_vs()**" function**.**

In case an error occurs when the modified JavaScript code is executed, an entry with the JavaScript interpreter error message will appear in the **Events log**.

To specify the values of the SVPflow arguments, use one of following methods:

- Locate the **override.js** file in the "**script**" subfolder, open it in a text editor, and enable (i.e. remove the "//" comment sign) the string containing the required parameter. For more information, see the description of the **SVPflow** modules.

  For example, to always use **SVP shader** equal to **13. Standard**, regardless of profile settings, enable the string "smooth.algo = 13".

- In the **User defined options** section, create a variable with a special name – take the option name from the **override.js** file and replace all "." with "_" in it.

For example, to be able to change the "smooth.scene.limits.m1" from the video profile, add the following option:

  o **Title**: "M1 limit"
  o **Script name**: "smooth_scene_limits_m1"
  o **Option scope**: "FRC profile"
  o **Allowed values**: "0,500,1000,2000,4000"
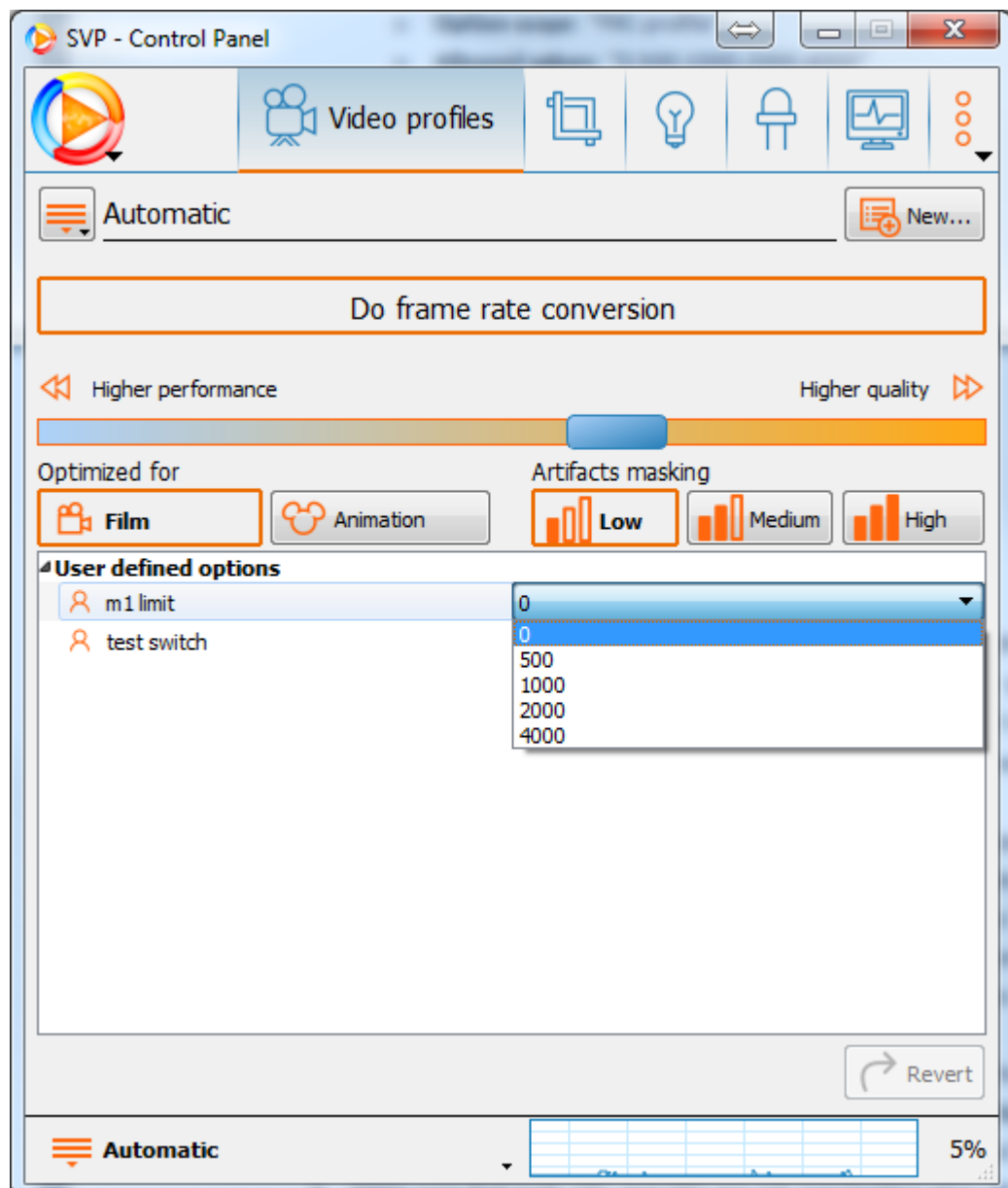
Troubleshooting

The most common problems when using SVP are the following:

- SVP does not "see" (detect) the video being played back.
- No improvement in the smoothness of the video is visible that would result from frame rate increase; the image is jerky and teared. To verify whether playback is smooth, turn on the **Fluency and tearing test** option in the **Utilities** submenu of the Main Menu. In this mode, a moving vertical orange bar is displayed over the video. Freeze-frame movement of the bar indicates a problem.
- Instability of the video player operation or the entire system operation, system crash.

To solve a problem, perform the following actions in the specified order:

1. Make sure the video player is configured correctly. Read the instructions on configuring your player in the **Information → Video player configuration** submenu of the Main Menu.
2. Make sure the system has sufficiently high performance for the selected profile options. See the "Monitoring the Performance" section.
3. Make sure the video drivers are installed correctly. For this, use the **OpenCL devices and capabilities** option in the **Information → Additional information** submenu of the Main Menu. The information about the **OpenCL** subsystem will be displayed.
4. Make sure that both CPU and GPU are not overheated when the frame rate conversion function is on.
5. If you use a 32-bit player in Windows, make sure you enabled "**4GB aware patch**". To do this, select the **Apply 4GB aware patch** option in the **Utilities** submenu of the Main Menu. Selecting this option launches a utility that modifies the executable (.exe) file of the 32-bit video player to enable it to use up to 3 GB of RAM. This prevents crashes of the player in the process of playing a **Full HD** video or larger. Before you perform this modification, you must close the player.
6. Check the log for errors (see the "Events log" section).
7. Read the FAQ on our website.
8. Contact SVP Technical Support (see the "Providing a Feedback" section).

Monitoring the Performance

The performance graphs show the current system load and the stability of the FRC function.

To quickly evaluate the CPU load, use the minified versions of the two graphs (**CPU utilization** and **SVP Index**) at the bottom of the Control Panel window. Left-click on it to switch to the other graph.
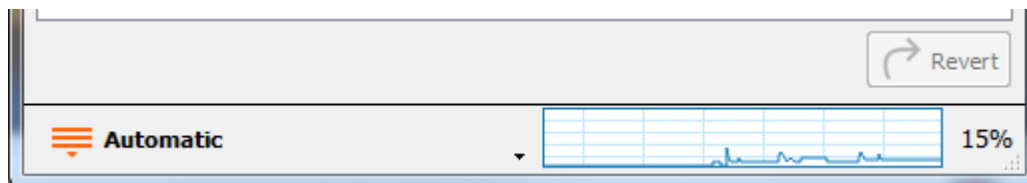

To view all available performance information, select **Utilities → Performance Monitor** from the SVP Main Menu. The **Performance monitor** section of the Control Panel opens.
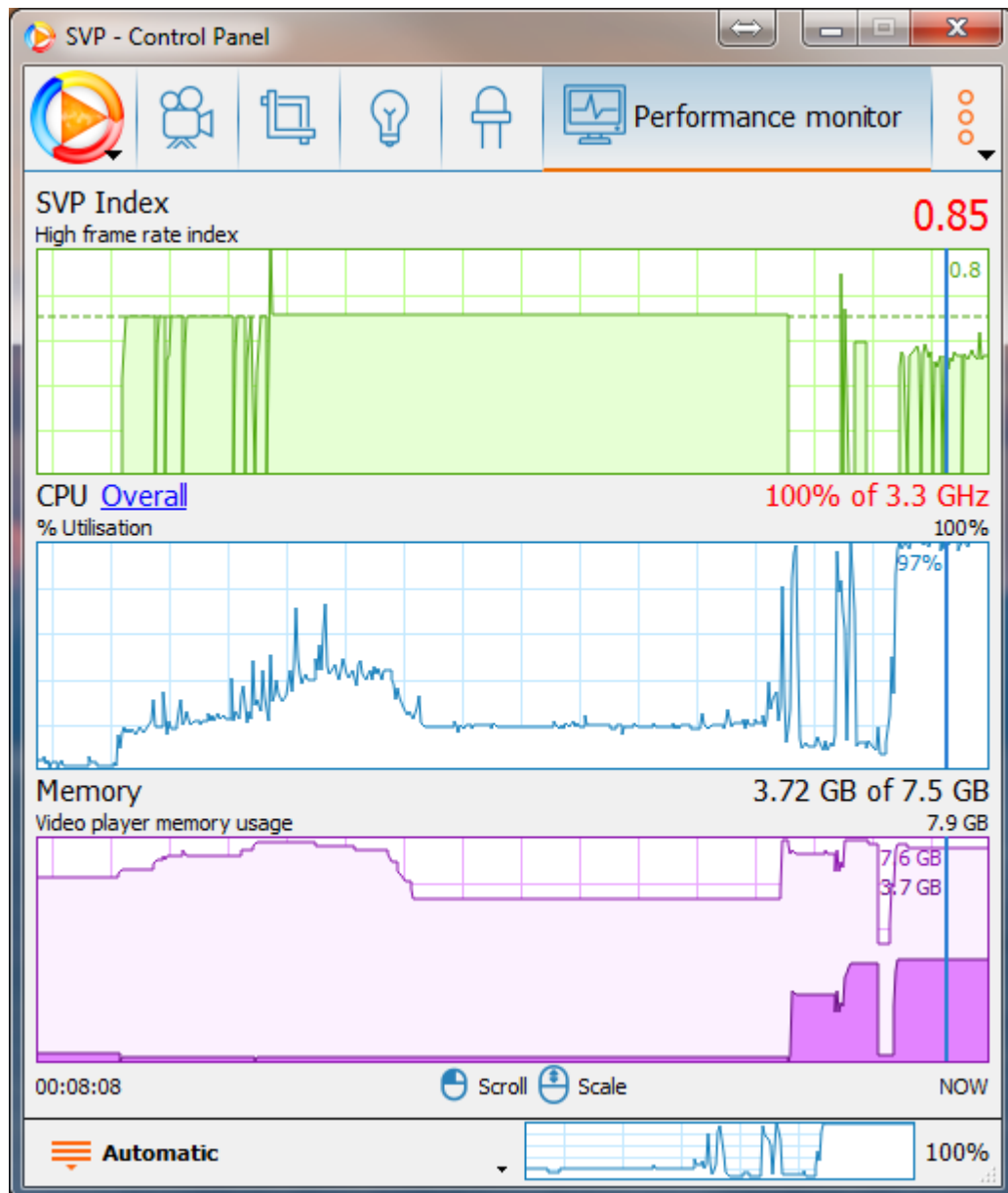
The values at the current moment (**NOW**) are shown at the right edge of the graphs and over time are shifting to the left. Graphs can be scaled up or down (by scrolling the mouse wheel) and shifted (by holding the left mouse button) in time. The thick lines at the right borders of the graphs indicate the shift from the **NOW** moment.

SVP Index – this graph shows the ratio of the achieved frame rate to the target value that should be close to 1.0. The acceptable deviation should be within the following range: -0.05...+0.1. A value less than 0.95 means that the system performance is too low to perform both new frame calculation and their rendering.
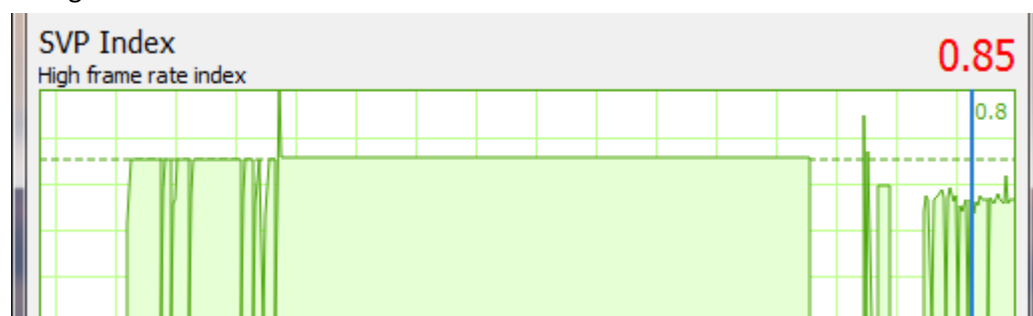
For example, for a video with a frame rate of 25 fps after its frame rate is doubled, 50 frames per second should be displayed on the screen. If the system is able to calculate or render only 40 frames per second, the **SVP Index** will be 40/50 = 0.8. In this case, you need to review the options used for calculation or rendering frames (see the video output settings in the video player).

CPU – this graph evaluates the CPU load, in percent. Double-click the graph to view CPU per core usage.
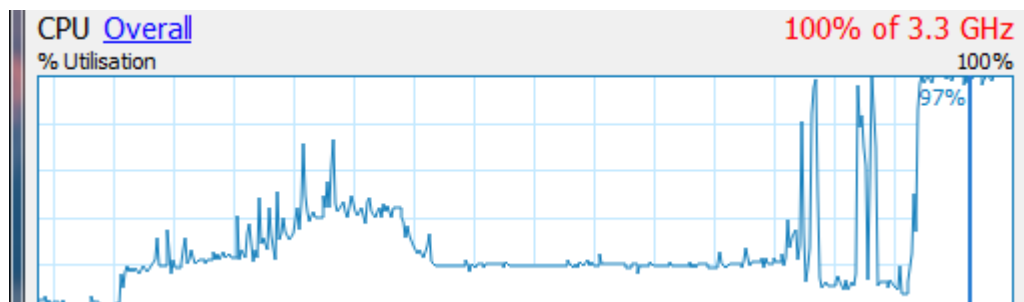
In addition, the graph can show current CPU frequency (in orange). This allows you to diagnose problems related to overheating. The graph of the current CPU frequency is displayed only in Windows 8 or later and macOS. For macOS, you should also install the "**Intel Power Gadget**" package.

**Memory** –– this graph shows the memory usage (the light-violet line)
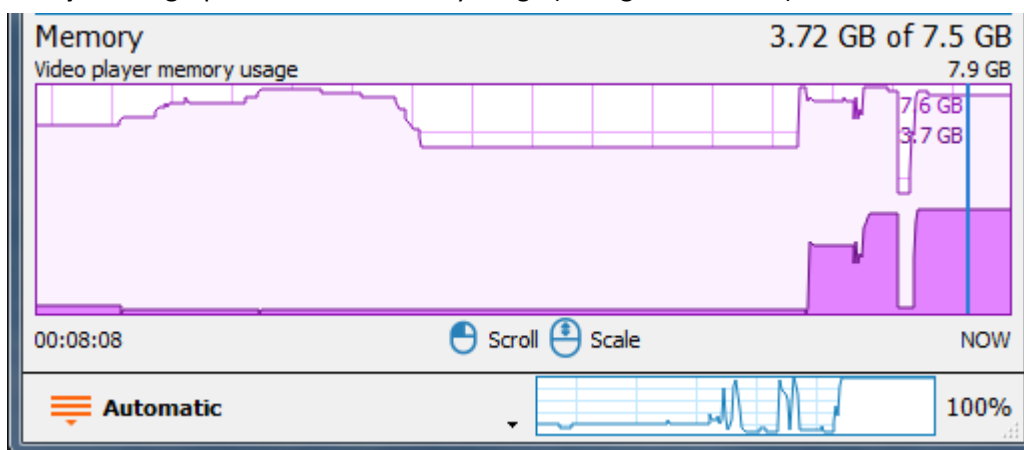
Additionally, during video playback, the dark purple line shows the usage of memory by the video player process. If a 32-bit player uses more than 2.5 GB of memory, its operation can become unstable and result in closure due to errors.

Events Log

SVP generates a variety of information messages. If any problem occurs, you should check the log for errors.

To view the log, select **Events log** in the SVP Main Menu. The **Events log** section of the Control Panel will open.
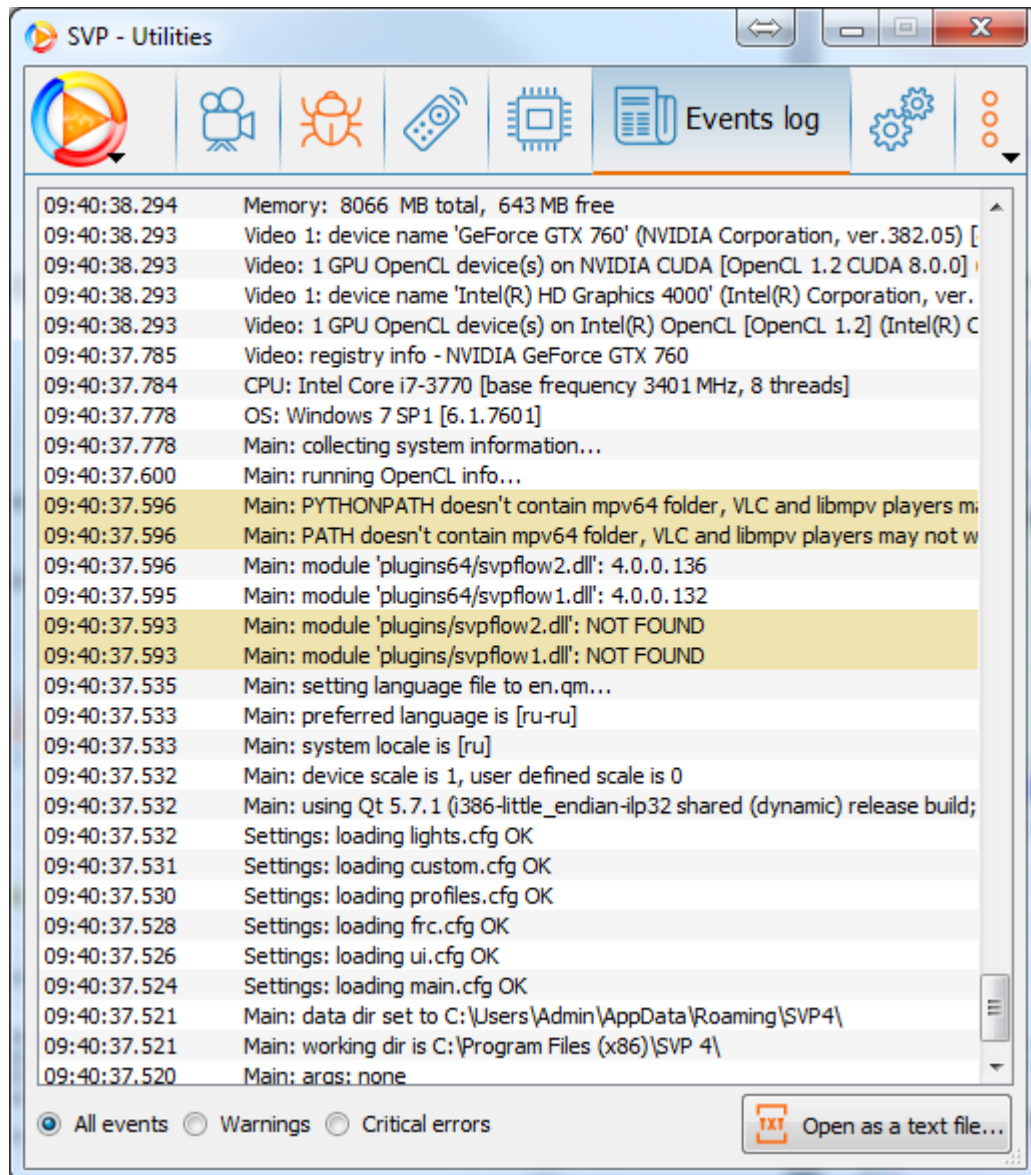
Newer messages are at the top of the list.

Some messages are highlighted in colors that indicate their importance: "warnings" are highlighted in yellow, while "errors" are highlighted in red.

To copy messages to clipboard, select several consecutive messages with the mouse, press the right button and select **Copy**. To open the entire log as a text file, click the **Open as a text file** button.

Providing a Feedback

If you did not find a solution for your problem in this document, please contact SVP Technical Support. We are trying to respond to all requests, however, in some cases you can get a quicker response at SVP forum.

To contact SVP Technical Support:

1. Select **Information → Send problem report** in the Main menu. The **Report a problem** section in the Control panel will open.

2. Describe your problem or suggest an improvement for SVP (preferably in English).
3. To receive a response from the Technical Support Service, select **I'd like to get reply to** and enter your email address.
4. If needed, add any relevant screenshots and other images that could help explain your problem (up to 5 files).
5. Click **Post report**.

When you contact SVP Technical Support Service, no confidential data is transmitted. Any request contains only the following data:

- program start log;
- program configuration;
- video profiles list;
- list of installed components;
- information about the **OpenCL** graphics subsystem;
- the texts of the **JavaScript** "generator" in case it was modified;
- performance counters listed in the "Monitoring of performance" section.